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Merchant Marine Act of 1928

DESIGNATED as above, what may well be considered a fair promise of renewed life and activity to the merchant marine and of the final and permanent acquisition by shipping of a place in the front rank of the nation's commercial activities, has been passed through the Committee on the Merchant Marine and Fisheries and reported before the House of Representatives. At the present writing this bill appears to have more than a fighting chance of being enacted into law.

It is extremely doubtful if the Jones Bill, as passed by the Senate, would be accepted by the House, under any circumstances; it is a practical certainty that a veto awaits it, should it by any chance reach the President. The present bill is the result of the efforts of the House committee to make possible the profitable operation of ships by private owners and to continue such of the activities of the Shipping Board as at present cannot well be abandoned. This to be done without, as seemed to be the main intent of the Senate bill, turning over practically the whole overseas shipping business to the latter organization and making the government's investment and activity in commercial shipping, to all intents and purposes, permanent.

In brief, the House bill proposes to encourage the embarkation of private individuals and companies in overseas shipping; first, by financing their new vessels or the re-conditioning and modernizing of their present vessels, to the extent of three-quarters of the total cost involved, at a low rate of interest; and second, by a system of liberal mail contracts, to make possible the continued and profitable operation of suitable vessels for a substantial period of time—ten years, to be exact. Furthermore, it is proposed that the government shall undertake the insuring, presumably at a low rate, of the vessels in which, as the result of the provisions of the bill, it has a financial interest.

There can be but little doubt that if this proposed bill becomes law, it will result in a very material increase in the shipbuilding operations of the country. It is understood that at least two of the large yards have at present provisional orders for new tonnage, which will become effective immediately the President signs the shipping bill. Other work is in sight, dependent upon the same condition. To what extent the Congress realizes that the actual life of the shipbuilding industry depends upon its prompt action, we do not know, nor how far the present deplorable conditions in the shipyards were considered in framing the present bill.

It is a matter of regret that the great disadvantages under which American shipyards labor are not given more specific consideration in the bill—it might easily have been done. Even in its present indirect manner of reaching the shipbuilding situation, however, it may well prove a lifesaver to what only too truly is, under present conditions, a dying industry.

Mail contracts alone will not insure a permanently complete and well rounded merchant fleet. It has been stated frequently that it must be the national aim to carry at least 50 percent of our overseas trade in our own ships, but it is out of all reason to suppose that all of these ships can, or will, carry mail. While it is true that the new bill provides certain rates for the carrying of mails on vessels of only 11 knots speed, such ships do not favorably impress one as mail boats, but they nevertheless form a large and useful part of any merchant fleet.

The provision of capital at low rates is an enormous help in the building of any vessel, but without the further aid of mail contracts it is evident that the actual benefits to the shipping industry at large would be very strictly limited and of relatively small extent. The most superficial consideration of present prices of

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American and foreign built vessels makes this situation quite clear. Take, for example, a foreign built steamer costing, say, $600,000—an equivalent ship, built at the present time in this country, would at the very least cost $900,000.

The general carrying charges of the foreign built ship may be taken at 14 percent of her cost, covering insurance, depreciation and interest or about $78,000 per year. For the American built vessel, if it is assumed that 75 percent of her cost is taken over by the government, at say, 2½ percent and the remaining 25 percent costs the owner 5 percent; furthermore, that insurance is furnished by the government at a reduced rate, then the annual carrying charges would be in the neighbornood of $100,000, or about 11 percent of the cost. Thus, notwithstanding the government aid in financing, the home built ship starts her career carrying a very material handicap and to this must be added the greater cost of operation, as compared to the foreign built vessel.

It is quite probable that attempts will be made in the House to amend the bill to meet the above mentioned conditions, but in the present emergency it seems essential that no slightest obstacle should be offered to the speedy enactment of the legislation as proposed. It seems assured of favorable consideration—may no stone be left unturned in the effort to make it law.

Operating Efficiency

SOME idea of what can be accomplished in improving the performance of a steamship by a crew that takes an intelligent interest in its work and goes out of its way to get results is shown by the record of the *Westerner* described on page 266 of this issue. The results speak for themselves and the fact that the average sea efficiency of this vessel for 5 years is 99.25 percent and her fuel consumption has been lowered from 113.88 barrels per 100 miles on her maiden voyage to 76.51 barrels per 100 miles on her last voyage is convincing evidence that something out of the ordinary has been going on aboard the vessel during her 5 years of continuous service under her present management.

The *Westerner* is one of a number of similar cargo steamers built for the Shipping Board during the war. Ten years ago these vessels were practically on an equal footing and were capable of giving the same results in service. Time has wrought a change, however, and today the *Westerner* stands out as the best ship in her class operating out of New York. Other vessels in this class have also obtained records of high efficiency which have won for them places in the Shipping Board honor roll, but, as they are operated on different routes and under different conditions, their performance cannot be compared directly with that of the *Westerner*.

The high caliber of the personnel aboard the *Westerner* has been responsible for the excellent results obtained. The members of the crew have taken a greater interest in their ship and have expended more time and energy and developed more resourcefulness in the actual maintenance of equipment than is found in most ships. These factors have combined to produce the more effective operation of every part of the vessel which in turn has resulted in the gratifying increase in efficiency and reduction in fuel consumption and operating costs as shown by the performance records. The *Westerner* is not only a fine example of what can be done by a crew that is interested in efficient operation but her record sets an example that might well be emulated by the crews of other ships.

Why are there not more *Westerners?* Not every ship can show the same results when operating under different conditions but there is always the opportunity for the crew of any vessel, either by following the methods adopted in the *Westerner* or by devising other more effective innovations, to increase the efficiency of operation and reduce operating costs. In most cases where a vessel has made a poor showing the responsibility lies with the crew. If marine engineers will profit by the experience of the crew of the *Westerner,* the solution of their particular problem in ship operation may be solved. It is to be hoped that this information will serve as an incentive for greater inter-crew competition and further reduction of ship operating costs.

Shipbuilding on the Lakes

IF the shipyards on the Great Lakes were dependent solely upon new construction for their profitable operation, the existence of many of them would be seriously threatened this year by the lack of orders. For the first time in several years no bulk cargo carriers are on the ways in any of the yards and the number of special types of vessels under construction, most of which are nearing completion, is relatively small. Notwithstanding the scarcity of orders for new work, however, the continued operation of these yards is assured by the large volume of repair and reconditioning work normally required each year to keep the immense fleets on the Great Lakes in efficient operation.

How extensive the Lake fleets are is shown by the statistics compiled by the Lake Carriers Association. At the beginning of the present year the combined fleets of Lake carriers consisted of 885 vessels of 3,244,995 gross tons. This represents an increase of 28 ships of 111,392 gross tons for the past year. The amount of vessel tonnage completed in 1927 for Lake service was the largest in any year since 1910. In all, 30 steel steamers, totalling 117,857 gross tons, were built. Three of the new ships are car ferries, a fourth is a self-unloading sand carrier but the remaining 26 are cargo carriers. Nine of the cargo carriers, aggregating 73,164 gross tons, are bulk freighters, eight of which are 600 feet or more in overall length. Thirteen of the new ships, aggregating 25,487 gross tons, were built in Great Britain, all being of full Welland canal size.

Following such an active year the dearth of orders

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for new vessels in the Lake yards this year would be cause for alarm if it were not for the repair work which forms the backbone of the shipbuilding business on the Lakes, and also if it were not for the fact that water-borne commerce on the Great Lakes shows no signs of diminishing. Last year the movement of ore, coal, grain and stone totaled 120,760,195 net tons which was the third largest movement of coarse freight in the history of Great Lakes shipping and only 529,307 net tons below the high water mark in 1926. As the volume of shipping on the Great Lakes reflects in a general way the industrial activity of the country, there is every reason to look for the continued development of this thriving industry in the future. Since 1920 when the Lake fleets consisted of 775 vessels of 2,708,959 gross tons, there has been a gain, despite sales and losses, of 110 ships and of 536,036 tons.

The Load Line Bill

ONE piece of legislation that should receive prompt action by the present Congress is the bill (S.1781) introduced in the Senate and reported out of the committee on commerce on April 5 without amendment to establish load lines for American vessels engaged in foreign trade. The bill authorizes the Secretary of Commerce to establish regulations indicating the maximum depth to which cargo vessels of 250 gross tons or more may safely be loaded and provides penalties for violation of this law. The necessity for establishing load lines for American vessels in overseas service by law has long been recognized as a safety measure. In doing this the United States is simply following the common practice in other maritime nations. There is no legitimate reason for opposition to such a law and the bill should be passed without delay.

Condenser Tubes

IT is a rather curious fact that some of the greatest obstacles lying in the path of high pressure and high temperature steam are found in that part of the steam power plant farthest removed from direct contact with either excessive pressure or excessive heat—the condenser. The construction of boilers to generate high pressure steam, superheaters to raise its temperature and turbines to convert its energy into mechanical work, have been made possible only by the cooperation of engineers and metallurgists. It has become very evident that the final solution of the condenser tube problem can come about only as the result of a similar co-ordination of effort.

So long as the reciprocating engine remained the principal type of prime mover, condensers in general did not contribute an undue proportion to the total of cares and worries assumed by the operating steam engineer in his daily routine work, but with the coming of the turbine and the accompanying importance of maintaining high vacuum, the condenser assumed a role of relatively greater importance, and the added work thrown upon it brought about a considerable development and modification in both its general and detail design.

Up to the time of the war, although much advance in form and integral arrangement of surface condensers had been made, with a view to increasing their vacuum-producing capacity, the tube troubles which for the past few years have occupied such a large share of the attention of steam engineers, while indicated, had not become acute.

Immediately following the war, serious tube trouble began to show itself, but, like many similar difficulties in other lines of engineering, it was attributed to inferior material resulting from intensive forcing of production. While in many cases this was very likely a correct diagnosis of the trouble, it was soon found that the tube troubles persisted, even in cases where the tubes were shown by chemical analysis to be fully equal in quality to their pre-war counterparts.

While some inferior tubes may still be occasionally encountered, there is no question but that first class material, judged by pre-war standards, can now be obtained, so that the conclusion has been forced upon many experienced steam engineers that neither the detail design nor the material entering into the construction of the older type of condenser can be uniformly depended upon to withstand successfully the heavy load placed upon them by the modern high pressure steam power plant.

So far as detail design is concerned, the most important departure from earlier practice is in the fastening of the tubes in the tube sheets. The method of packing these joints with tape or similar material, confined in a stuffing box or gland, is not only bothersome and expensive to maintain, but, due to unequal grip upon the different tubes, is a fertile source of leakage and even of damage to the tubes themselves. Expanding the tubes into the sheets appeared at first a radical step, and with straight tubes no doubt might cause trouble, but with curved tubes to take care of expansion this difficulty appears to be overcome, and curved tubes firmly expanded into the tube sheets at each end are by way of being generally adopted.

While the expanded tube condenser has overcome many difficulties, the major portion of condenser troubles is in the tubes themselves, regardless of the manner in which they are secured. It is not altogether clear whether all the tube trouble which has developed in recent years is due to the tube material or not, but at least it is certain that some materials are more resistant than others to the action—chemical, mechanical or a combination of the two—which causes the excessive wasting away, now so frequently experienced. Chemical action, no doubt, is responsible for some damage but recent very painstaking investigations carried on abroad point to the mechanical action of air entrained in the rapidly moving and eddying cooling water as the principal offender. The fact that most of the damage usually occurs inside the tubes, a short distance in from the point of entrance of the cooling water and also that it is often confined

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to groups of tubes in certain portions of the condenser, seem to bear out this conclusion.

The efforts to meet the increased demands coming upon the tube have, in general, pursued three different lines: improvement in the mechanical methods of manufacture, the application of protective coatings to the water side of the tubes, and modifications of the alloys of which the tubes are made.

Improvement in mechanical methods has resulted in the production of practically flawless tubes, laminations resulting from gas pockets or blow holes being practically eliminated and useful tube life thereby greatly increased.

Protective coatings of bitumastic solutions, or resulting from an oxidation of the tube material, have given good results. As before mentioned, corrosion is usually active in certain regions in the condenser, and much less acute or even non-existent in others. By replacing tubes which have failed with others which have merely received thin coatings of oxides in one of the neutral zones very satisfactory results have been obtained, as new or "raw" tubes are peculiarly susceptible to corrosive action.

If one may judge by the articles in her engineering publications, tube troubles are more acute in Great Britain than in this country. There the matter has been the subject of most painstaking investigation by certain of the technical and engineering societies, attention being largely given to the production of new corrosion-resisting alloys. Certain of the British investigators attribute the failure of brass tubes to their zinc content, and working on this theory are extensively trying out copper-tin and copper-nickel tubes.

According to a writer in the Liverpool *Journal of Commerce*, tubes composed of copper 70, zinc 30 have been in use for a considerable time on board ships, and a single case of failure is yet to be reported.

If further experiences bear out the results so far obtained, it would appear that the condenser is in a fair way of becoming as reliable a link as either of the others in the high pressure steam plant chain.

Welding

PROBABLY all shipbuilders and ship repairers, particularly the latter, will agree that the greatest improvement in the operative side of their business during the past decade has been the introduction of electric and autogenous welding and burning. Not only have the shaping and preparing of many of the structural parts entering into the hull of a steel vessel been greatly facilitated and cheapened by the application of these processes, but the repairing and renewal of certain members in old vessels, which under the former methods involved prohibitive expense, have in many instances now become a relatively easy matter, calling for an expenditure of material and labor which is almost negligible when compared with the cost of effecting a similar repair but a few years ago.

The very important part played by both welding and burning in the emergency repairs carried out on the interned German vessels early in the war doubtless had much to do with their rapid adoption since that time. Certain it is that only by the application of such methods was it possible to make these vessels ready in time for the work they were called upon to perform in transporting troops and supplies across the Atlantic, and, as everyone knows, any delay in this transportation might easily have proved disastrous to the Allied cause. We believe it no exaggeration to say that welding contributed very materially to the winning of the World War.

While the spectacular work of the welders in repairing the damaged cylinders and other important parts of the engines of the great German ships may have no exact counterpart under the more prosaic conditions of peace time shipbuilding and repairing, it at least showed in a most convincing way what they were capable of accomplishing under the pressure of necessity, and opened up a vista of possibilities in steel and iron construction which previous to the war had quite generally been considered as the optimistic dreams of enthusiasts. However, the dreams are now rapidly evolving into realities, which are proving of untold benefit to everyone concerned with the building and maintenance of steel ships and their machinery.

Perhaps the greatest obstacle in the way of the adoption of welding for important parts of hull or machinery is the difficulty (and in many cases the impossibility) of actually testing the weld. No doubt the time will come when the strength of a weld will be counted upon with the same degree of assurance now accorded to riveted joints, but that time is not yet, and in consequence welding is largely confined to such parts as are not called upon to bear heavy loads, or whose failure would not involve serious trouble or disaster. That satisfactory welds in important parts can be made has been proved many times over. The cylinders of the German ships are an outstanding example, but they could be tested by hydraulic pressure and unfortunately but a comparatively small portion of welds can be proved by this means.

The use of the X-ray for detecting faults in welds has been suggested, but except for very considerable imperfections this would appear of rather doubtful value, particularly in view of the fact that its effectiveness is apparently limited to material of less than an inch in thickness. Testing by means of electrical conductivity has also been suggested, the resistance to the current varying with the character and closeness of the weld. In both cases, the apparatus required is expensive and difficult to set up and operate—in the present "state of the art" they can hardly be looked upon as more than possibilities.

After all, the effectiveness of welding, like many other processes, is very largely dependent upon the skill of both the designer of the weld and the operator who makes it. No further proof is needed that good welds can be and are daily being made under a wide variety of surrounding conditions. There can be no doubt but that, as time goes on, welding of important structures will become a common practice and be accorded a confidence equal to that now given to methods which, in all probability, it eventually will to a great extent supersede.

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House to Act on Marine Legislation

White bill reported out of committee—Provisions include ship construction loans, mail contracts, naval reserve pay, insurance fund — Load line bill reported in Senate

By Harold F. Lane

WASHINGTON, D. C.

THE new merchant marine bill drafted by the House committee on merchant marine and fisheries as a substitute for the Jones bill, S. 744, which was passed by the Senate in January, was reported to the House on April 17 by Chairman White, of the committee, after having been approved by the committee a week before.

In its report to the House the committee expressed the opinion that the bill will not cost the government in excess of $10,000,000 a year and added:

"Your committee members have faith in the legislation presented to you. It gives to the American ship greater aids than have been provided by any legislation within three-quarters of a century. We believe its enactment means the building of new vessels of greater speed than any now flying our flag; that it will revive the shipbuilding industry; that it will stimulate an increased use of American ships for American cargoes; that it will give us a larger measure of industrial and commercial independence; that it will provide us with naval auxiliaries for the day of stress; and that it will carry to all the world notice of our settled purpose to retain upon the seas that which we now have and of our determination in due process of time to build and maintain a merchant marine of a size and efficiency commensurate with our national interests and our national dignity."

The bill is a composite of provisions included in several bills which were under consideration by the committee and would strike out all but the enacting clause of the Jones bill, but it follows the latter in general to the extent that it provides for a continuation of the policy of government ownership and operation by the Shipping Board until a transfer to private capital can be brought about, and for a replacement program. It also makes some changes in the Jones bill and adds provisions for aid to a privately owned and operated merchant marine.

Loan Fund to Be Increased

The bill would increase the government ship construction loan fund from $125,000,000 to $250,000,000 to aid the construction of ships for private operation by making loans up to 75 percent of the cost of a vessel at rates of interest approximating the cost of money to the government when they are to be operated in foreign service. Provision also is made for contracts for the carrying of mails, with rates based on a classification of vessels by speed and tonnage, with provision for a special rate for vessels capable of maintaining a speed of 24 knots and for a supplementary airplane service, as proposed by the Transoceanic Corporation.

Other provisions in the bill not in the Jones bill are those for the maintenance of a merchant marine naval reserve and for the creation of an insurance fund to be administered by the Shipping Board for carrying risks on vessels and plants in which the government has an interest. Federal officials and employees would be required to travel on American ships when engaged in government business.

Like the Jones bill, the new White bill provides that the Shipping Board shall not sell any vessel or line of vessels except when in its judgment the building up and maintenance of an adequate merchant marine can be best served thereby, but instead of requiring a unanimous affirmative vote of the members of the board it provides that such decision may be reached by five members. An amendment to the Jones bill, adopted in the Senate, placing employees of the Fleet Corporation under civil service was not included in the House bill.

Provisions Made for Ship Replacement

Provision is made for the reconditioning of vessels owned by the United States so as to equip them adequately for competition in foreign trade, but instead of an indefinite authorization of appropriations necessary for replacements, the bill authorizes and directs the Shipping Board to present to Congress from time to time recommendations setting forth what new vessels are required and the estimated cost, to the end that Congress may from time to time make provision for replacements and additions.

A vigorous effort will be made to pass the bill through the House and to have it adopted by the Senate in place of the Jones bill, but in view of the approaching adjournment of Congress and the rapidly increasing difficulty of obtaining agreement on controversial questions as the end of the session and the opening of the political conventions approaches, the prospects are said to be somewhat uncertain.

Section 203 contains the provision for replacements, as follows:

"The necessity for replacement of vessels owned by the United States and in the possession or under the control of the board and the construction for the board of additional up-to-date cargo and passenger, and passenger ships, to give the United States an adequate merchant marine, is hereby recognized, and the board is authorized and directed to present to Congress from time to time recommendations setting forth what new vessels are required for permanent operation under the United States flag in foreign trade and the estimated cost thereof, to the end that Congress may, from time to time, make provision for replacements and additions. All vessels built for the board shall be built in the United States, and they shall be planned with reference to their possible usefulness as auxiliaries to the naval and military services of the United States."

The provision as to the construction loan fund provides:

"For making loans to aid private citizens of the United States in the construction by them in private shipyards or navy yards in the United States of vessels of the best and most efficient type for the establishment or maintenance of service on lines deemed desirable or necessary by the board, provided such vessels shall be fitted and equipped with the most modern, the most efficient, and the most economical engines, machinery, and commercial appliances; or in the outfitting and equipment by them in private shipyards or navy yards in the United States of vessels already built, with engines, machinery, and commercial appliances of the type and kind mentioned; or in the reconditioning, remodeling, or improvement by them in private shipyards or navy yards in the United States of vessels already built."

All such vessels shall be documented under the laws of the United States and shall remain documented under such laws for not less than twenty years from the date the loan is made and so long as there remains due the United States any principal or interest on account of such loan. Other provisions relating to the loans follow:

"No loan shall be made for a longer time than twenty years. If it is not to be repaid within two years from the

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date when the first advance on the loan is made by the board, the principal shall be payable in equal annual installments to be definitely prescribed in the instruments. The loan may be paid at any time, on thirty days' written notice to the board, with interest computed to date of payment.

"All such loans shall bear interest at rates as follows, payable not less frequently than annually: During any period in which the vessel is operated exclusively in coastwise trade, or is inactive, the rate of interest shall be as fixed by the board, but not less than 5¼ per centum per annum. During any period in which the vessel is operated in foreign trade the rate shall be the lowest rate of yield (to the nearest one-eighth of 1 per centum) of any government obligation outstanding at the time the loan is made by the board, as certified by the secretary of the treasury to the board upon its request. The board may prescribe rules for determining the amount of interest payable under the provisions of this paragraph.

"No loan shall be for a greater sum than three-fourths the cost of the vessel or vessels to be constructed or than three-fourths of the cost of the reconditioning, remodeling, improving or equipping hereinbefore authorized for a vessel already built."

Ten Year Mail Contract Provided

As soon as practicable after the enactment of the act and from time to time thereafter the postmaster general is to certify to the Shipping Board what ocean mail routes, in his opinion, should be established or operated for the carrying of the United States mails between ports, (exclusive of Canada) between which it is lawful under the navigation laws for a vessel not documented under United States laws to carry merchandise, distributed so as equitably to serve the Atlantic, Mexican Gulf, and Pacific coast ports, the volume of mail moving and the estimated volume for five years, and other requirements. The board is then to certify the characteristics of the vessels to be employed and other related facts, taking into consideration "the desirability of having the mail service performed by vessels constructed in accordance with the latest and most approved types, with modern improvements and appliances."

The postmaster general would then be authorized to enter into contracts for not more than ten years with citizens of the United States whose bids are accepted for the carrying of the mails, the contracts to be awarded to the lowest bidder who, in the judgement of the postmaster general, possesses such qualifications as to insure proper performance of the mail service under the contract.

Vessels employed in ocean mail service are to be divided into classes, ranging from those of a speed of 10 knots and of a gross registered tonnage of not less than 2,500 tons, up to those of a speed of 24 knots and not less than 20,000 tons and rates of compensation are provided as follows:

Compensation Under Contracts

"The rate of compensation to be paid under this title for ocean mail service shall be fixed in the contract. Such rate shall not exceed: for vessels of class 7, $1.50 per nautical mile; for vessels of class 6, $2.50 per nautical mile; for vessels of class 5, $4 per nautical mile; for vessels of class 4, $6 per nautical mile; for vessels of class 3, $8 per nautical mile; for vessels of class 2, $10 per nautical mile; and for vessels of class 1, $12 per nautical mile. As used in this section the term 'nautical mile' means 6,080 feet."

When the postmaster general is of opinion that the interests of the postal service will be served thereby, he may, in the case of a vessel of Class I capable of maintaining a speed in excess of 24 knots at sea in ordinary weather, contract for the payment of compensation in excess of the maximum compensation authorized, but not more than the same ratio to $12 as the speed which the vessel is capable of bears to 24 knots. Additional compensation may be allowed on account of the use of airplanes or airships.

Merchant Marine Naval Reserve

Provisions for the merchant marine and naval reserve follow:

"In addition to the pay prescribed by existing law for officers and enlisted men of the merchant marine naval reserve when not employed on active duty with the regular Navy, it is provided that such officers and enlisted men of the merchant marine naval reserve as are employed on merchant vessels of United States registry regularly engaged in foreign trade shall be paid per annum by the navy department under such regulations as the secretary of the navy may prescribe an amount equal to two months' base pay of their corresponding grades, ranks, or ratings in the regular navy, such payments so made by the navy to be considered, in all laws or agreements referring to the officers and crew of the merchant marine, as an integral part of the total pay prescribed for such officers and crew in accordance with such laws and agreements.

Insurance Fund

Section 10 of the Merchant Marine Act, 1920, is amended to read as follows:

"Sec. 10. That the board may create out of insurance premiums, and revenue from operations and sales, and maintain and administer a separate insurance fund which it may use to insure in whole or in part against all hazards commonly covered by insurance policies in such cases, any legal or equitable interest of the United States (1) in any vessel constructed or in process of construction; and (2) in any plants or property in the possession or under the authority of the board. The United States shall be held to have such an interest in any vessel toward the construction, reconditioning, remodeling, improving, or equipping of which a loan has been made under the authority of this Act, in any vessel upon which it holds a mortgage or lien of any character, or in any vessel which is obligated by contract with the owner to perform any service in behalf of the United States to the extent of the government interest therein."

Under the provisions of the bill the following vessels may be taken and purchased or used by the United States for national defense or during any national emergency declared by proclamation of the president:

" (1) Any vessel in respect of which, under a contract hereafter entered into, a loan is made from the construction loan fund created by section 11 of the Merchant Marine Act, 1920, as amended—at any time until the principal and interest of the loan has been paid; and

(2) Any vessel in respect of which an ocean mail contract is made under Title IV of this Act—at any time during the period for which the contract is made.

(b) In such event the owner shall be paid the fair actual value of the vessel at the time of taking, or paid the fair compensation for her use based upon such fair actual value; but in neither case shall such fair actual value be enhanced by the causes necessitating the taking. In the case of a vessel taken and used, but not purchased, the vessel shall be restored to the owner in a condition at least as good as when taken, less reasonable wear and tear, or the owner shall be paid an amount for reconditioning sufficient to place the vessel in such condition. The owner shall not be paid for any consequential damages arising from such taking and purchase or use.

(c) The president shall ascertain the fair compensation for such taking and purchase or use and shall certify to Congress the amount so found by him to be due, for appropriation and payment to the person entitled thereto. If the amount found by the president to be due is unsatisfactory to the person entitled thereto, such person shall be entitled to sue the United States for the amount of such fair compensation and such suit shall be brought in the manner provided by paragraph 20 of section 24 or by section 145 of the, Judicial Code, as amended."

The bill includes the declaration which was included in the Jones bill, reaffirming the policy and primary purpose declared in section 7 of the Merchant Marine Act, 1920.

It also contains a provision that "in the allocations of the operations of the ships, the Shipping Board shall distribute them as far as possible and without detriment to the service among the various ports of the country."

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Abstract of Committee Report

The text of the committee report as presented by Mr. White which includes a detailed explanation of the provisions of the House bill follows in part:

It should be noted that there is included in the House amendment the substance of the Senate bill. The first section of the Senate bill is incorporated in the House amendment without change, except for the addition of the code reference. The second section of the Senate bill appears as Section 201 of the House amendment. It is, however, in a modified form. The Senate provision required a unanimous vote of the members of the Board to authorize the sale of any vessel or of any line of vessels. The House amendment has changed the requirement of a unanimous vote to that of an affirmative vote of five members of the Board.

Section 3 of the Senate bill appears in redrafted form as Section 202 of the House amendment. The Senate section authorized the Board, in addition to making ordinary repairs, to recondition and improve vessels owned by the United States. Existing law gives to the Board authority to recondition and keep all vessels of the Board in suitable repair, so that the only change made by Section 3 of the Senate bill in existing law was in the authority given to improve vessels of the United States. The House section provides that in addition to the powers given by existing law to recondition and repair, the Board may remodel and improve vessels. It is not altogether clear what the Senate meant by the use of the word "improve." The House committee, however, retains this word but adds the more clearly understood authority to "remodel" vessels. It was also thought by your committee that with respect to vessels remodeled or improved there should be a limitation upon the right to transfer to foreign registry and Section 202, therefore, contains a provision that any vessel remodeled or improved under the authority of the section shall be and shall remain documented under the laws of the United States for not less than five years, and so long as there remains due the United States any money or interest on account of such vessel, and that during such period it shall be operated only on voyages which are not exclusively coastwise. This section of the House amendment does not take from but rather adds to the corresponding Senate provision.

Section 4 of the Senate bill dealt with new construction for the replacement of vessels owned by the United States and in the possession of the Board. It declared that the necessity for replacement of vessels of the Board and the construction either by the Board or by private American companies of additional ships to give the United States an adequate merchant marine, is recognized. It then directed the Board to present to Congress from time to time its recommendations setting forth what new vessels are required, together with any proposals made by private citizens of the United States for the replacement of these vessels and their operation in foreign trade and the estimated cost thereof, to the end that Congress might from time to time make provision for replacements and additions.

Section 203 of the House amendment follows somewhat closely this Section 4 of the Senate bill. It omits, however, all reference to proposals of private citizens for the construction of ships. It seemed unwise to your committee to include in a section dealing primarily with government ships, any requirements with respect to the construction of ships on private account. Your committee was the more inclined to this view because of other provisions in its amendment to the Senate bill for the encouragement of construction by private interests of ships for their own account. The Senate draft also seemed to suggest that replacements and construction deemed desirable might be made *by* the Board. Your committee did not wish to sanction the undertaking of such shipbuilding enterprises by the Board. Section 5 of the Shipping Act of 1916 gave the Shipping Board authority to construct vessels, but this right was expressly taken away by the Merchant Marine Act of 1920. Your committee was unwilling to approve language which might be construed to restore this authority to construct vessels by the Board itself and so in its redraft of this Section it refers to replacements and new construction *for* the Board rather than *by* the Board. Under the House phraseology, if replacements or construction are hereafter begun your committee would have it done by contract for the government's account and would not re-establish the Shipping Board as a shipbuilding agency.

Under the Senate section and under your committee's recommendation, the Board must submit its recommendations as to these matters to the Congress to the end that the legislative branch of the government may determine on the action to be taken. Under either draft, authority for replacements or new construction will be given or withheld as Congress may hereafter determine upon the recommendations and representation from time to time made, and appropriations will then be in order to make effective the authorizations agreed upon.

Section 5 of the Senate bill first authorizes the appropriations necessary to accomplish the purposes of the Act, and follows this with a proviso that the offices, employments and positions under the Shipping Board and under the Fleet Corporation, with certain exceptions, shall be subject to the Federal laws relating to the Classified Civil Service. That portion of Section 5 authorizing the necessary appropriations for the purposes of the Act is included in the House amendment. Your committee do not approve the extension of the Classified Civil Service to those positions within the Fleet Corporation requiring special knowledge of shipping and of ship operations. The general provisions of the civil service laws cover most of the positions under the Shipping Board. Your committee believe it wise not to undertake an extension of the Civil Service in this legislation.

Section 6 of the Senate bill finds its counterpart in the House amendment.

Section 7 of the Senate bill is also included as Section 806 of the House amendment.

The foregoing indicates the provisions of the Senate bill which are incorporated in the House Amendment.

The House Amendment

Your committee believe that in reporting this amendment they are responding to the desire of the American people. In our view, there has been no time within three-quarters of a century in which the country has been so interested in an American merchant marine, so anxious that the Congress should provide the ways and means for restoring to the American ship that prestige which was once the nation's pride. Your committee offer this bill for your consideration in the confident belief that if administered to the extent of the authority given and in accordance with its purpose, shipbuilding within the United States will be stimulated, new and modern ships flying our flag will appear upon the seas, interest in our ships will be stirred, a new loyalty will be aroused in American shippers, and we shall have accomplished much toward the restoration of American supremacy upon the seas. This report is not the thought of any party or any section of the country represented upon your committee. All members have striven to compose differences and to reach agreements.

Our merchant marine has been a subject of general discussion in the press, by the public, and within the halls of Congress during late years. Your committee assume, therefore, that the main facts with respect to our foreign trade, the percentages of our exports and imports carried in American ships both governmentally and privately owned, the costs of construction of ships here and abroad, the operating and subsistence differentials between American and foreign flag ships and the advantages to our nation of having available its own ships for the carriage of its commerce, are in the minds of the members of the House. Your committee believe, too, that the necessity for ships of the higher speeds as auxiliary naval and military vessels is also appreciated by this body. It takes for granted, also, that the American people prefer to see our ships privately owned and operated rather than owned and operated by the government itself, but that in any event the Congress desires essential trade routes to be maintained. It is further accepted as beyond doubt that the American people are ready and willing to pay such amounts as may be reasonably necessary to give to the United States the size and character of merchant marine required to meet these public expectations. This report, therefore, will contain no argument upon matters which we conceive to be generally understood and beyond dispute. It will be confined to a description of the bill itself and an estimate of the expenditures involved.

The general provisions of the various sections of the bill as presented appear in the first section of this summary. Omitting reference to these sections, the report continues:

The specific aids carried in this bill in no way depart from principles heretofore recognized and approved by many Congresses. Loans for construction of vessels, contracts for payment of mail services, authority to insure to the extent of the government's interest, and the building up of a merchant marine naval reserve, have all heretofore been sanctioned by Congress. Your committee believe, however, that in the provisions of the present bill we have so expanded and so liberalized existing law that these methods will be vitalized and made effective towards the upbuilding of our merchant marine.

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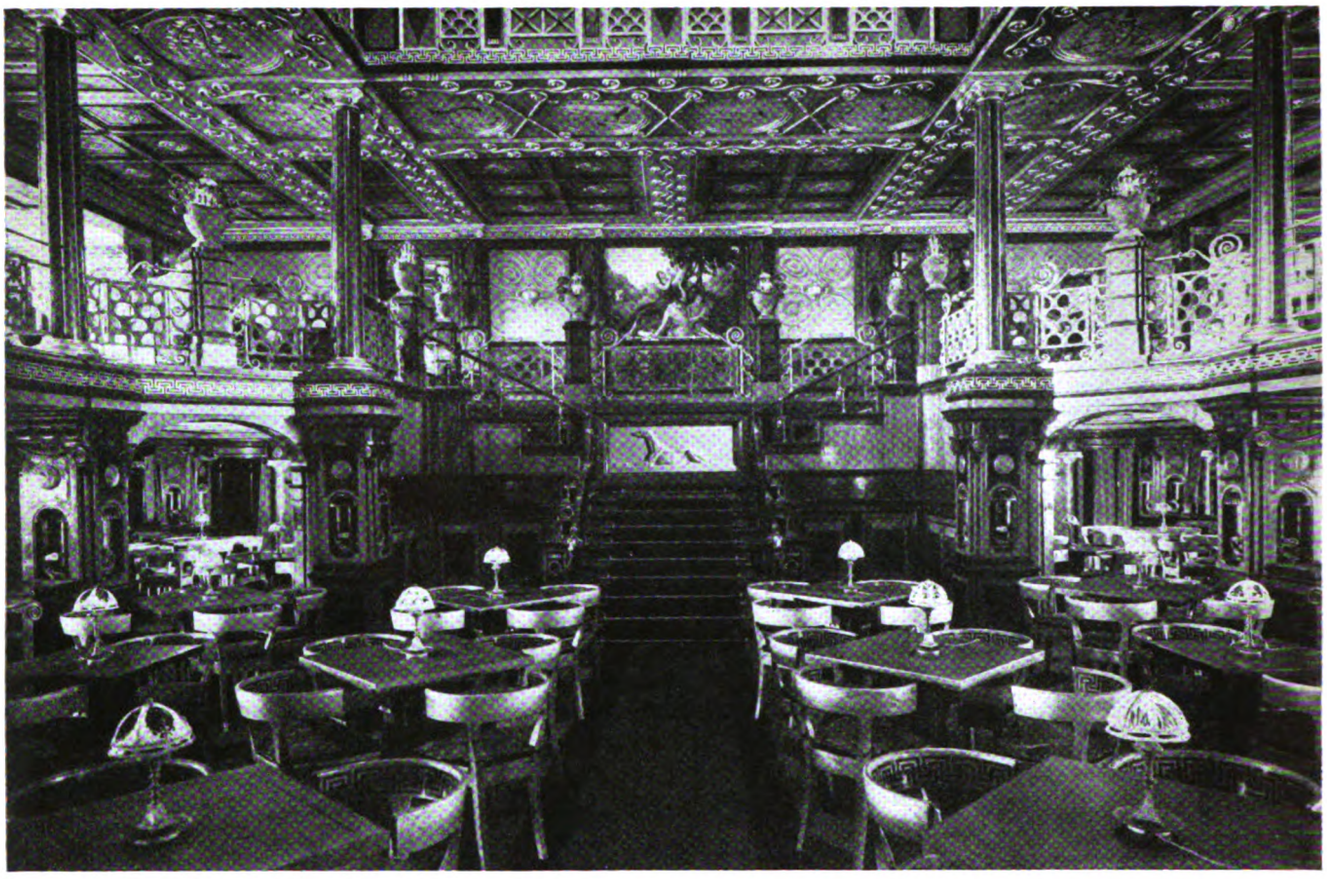

Dining room

Social hall

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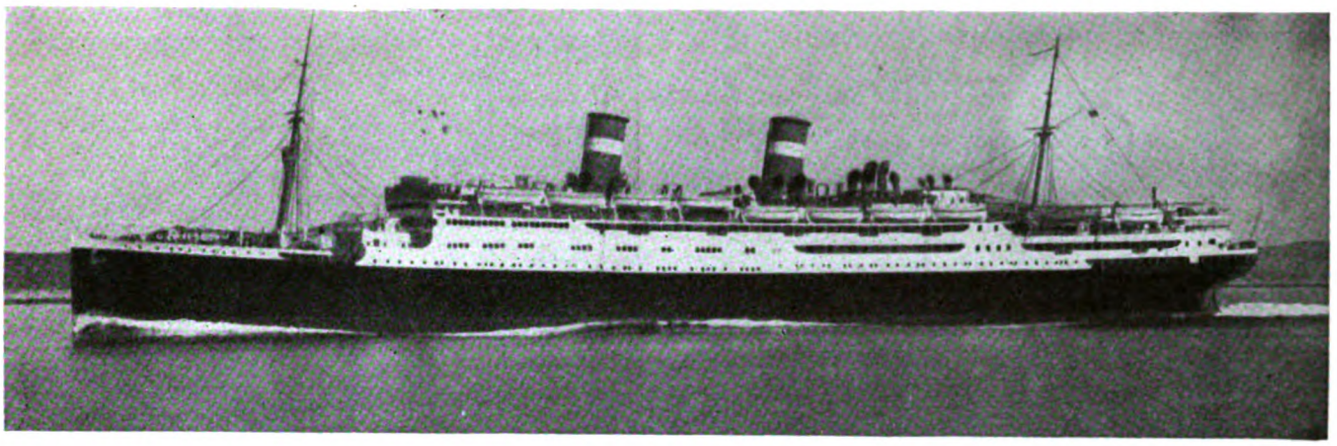


New Lloyd Sabaudo liner Conte Grande of 23,000 gross tons

Passenger Steamship Conte Grande

Built by the Stabilimento Tecnico Triestino for the Lloyd Sabaudo of Genoa

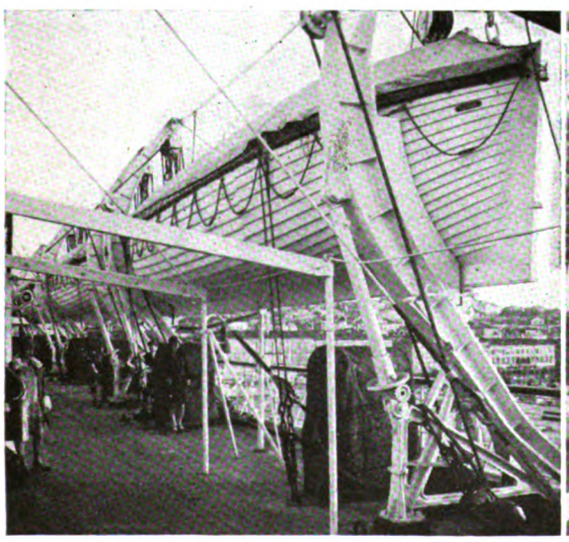
IN keeping with the progressive policy of the Italian steamship lines, the Lloyd Sabaudo has just placed in its New York-Mediterranean service the 21-knot twin screw geared turbine steamship *Conte Grande* just completed by the Stabilimento Tecnico Triestino. She is a vessel of about 23,000 gross tons with accommodations for 578 first class, 256 second class, 164 intermediate second class and 720 third class passengers and a crew of 532. She is a sister ship of the *Conte Biancamano,* built for the same company in 1925 by William Beardmore & Company, Ltd., Dalmuir, Scotland, and with this ship will maintain the company's service between Genoa, Naples, Gibraltar and New York.

The *Conte Grande* was launched on June 29, 1927, seven months after the laying of the keel. On her official trial she developed an average of 21.83 knots with the propellers turning at 110 revolutions per minute. Her contract speed was 21 knots. Her principal dimensions are as follows:

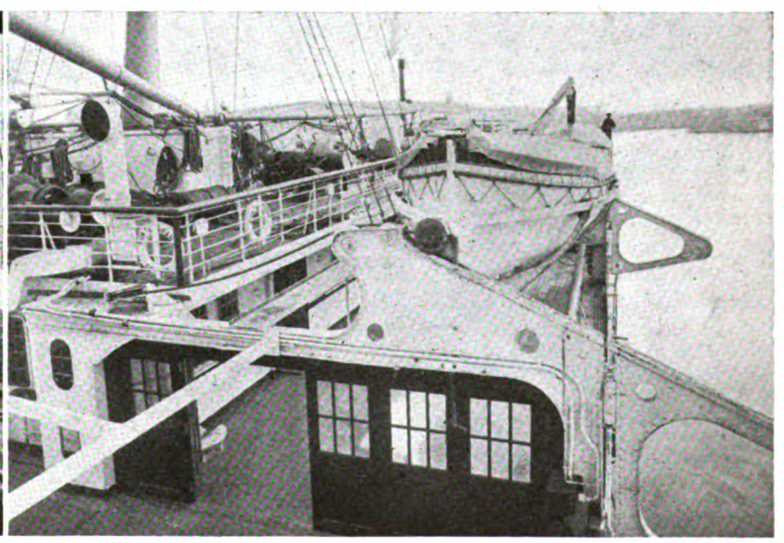
Length overall	655 feet
Length on waterline	635 feet
Length between perpendiculars	625 feet
Beam, molded	76 feet
Depth, molded to shelter deck	39 feet 6 inches
Load draft	26 feet
Gross tonnage, about	23,000
Shaft horsepower	26,000
Contract speed	21 knots

The vessel is of the shelter deck type without tonnage opening. She has a straight stem, raked forward, and an elliptical stern and is fitted with two masts and two smokestacks. There are 8 decks, the main, upper and shelter decks extending all fore and aft while the lower decks are interrupted by the engine room. The double bottom is of the cellular type with floors on each frame and 3 longitudinals on each side of the main keelson.

Cargo is carried in 3 holds forward which are served by 3 cargo hatches and in refrigerated spaces aft which are served by two cargo hatches. Further aft there is another hatch for handling mails. The holds have a capacity for 3,000 tons of general cargo and mails. Cargo is handled by five 1½-ton, ten 3-ton, one 7-ton and two 10-ton derricks served by steam winches. The refrigerating machinery consists of 2 Hall machines in-



Lifeboats under Welin davits



Special launching davits

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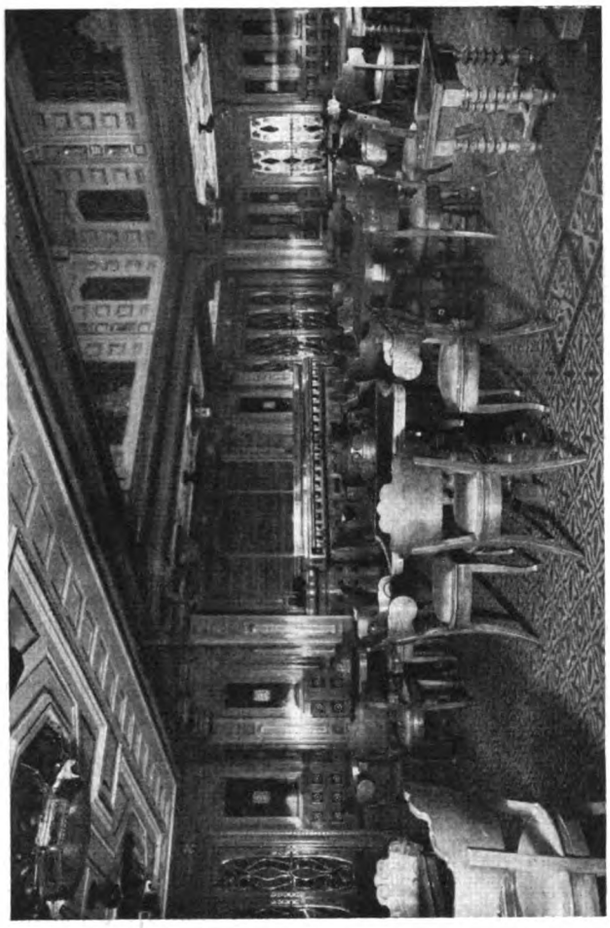
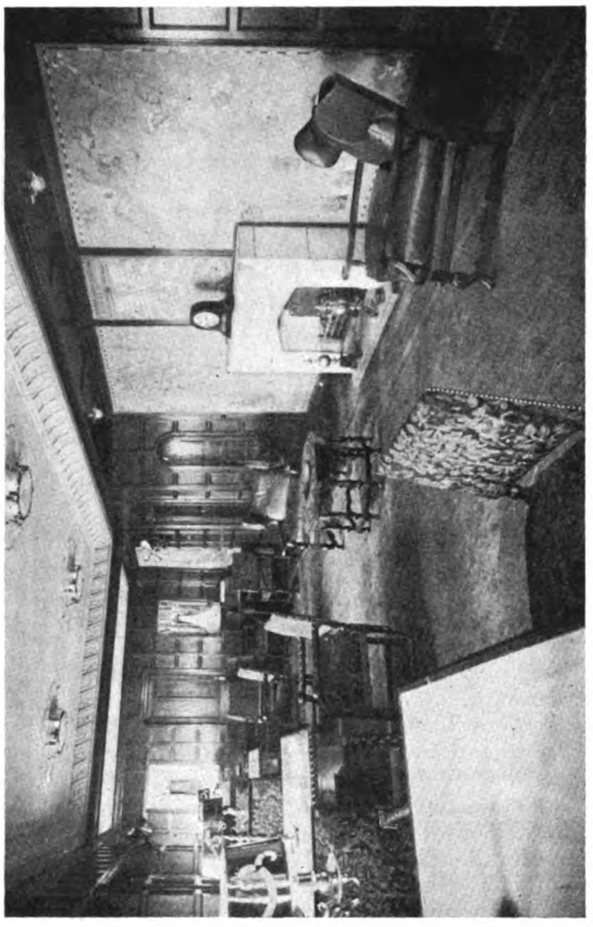
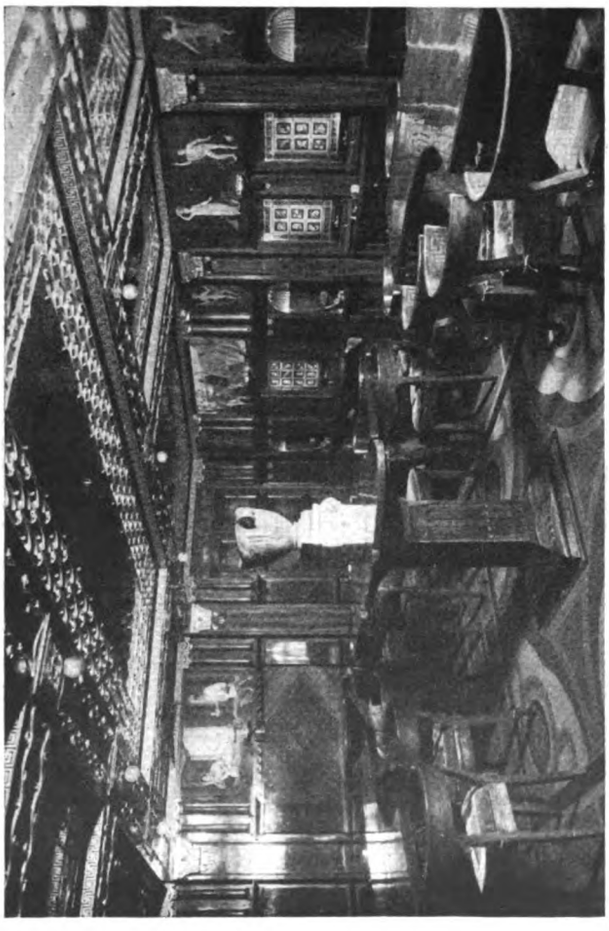


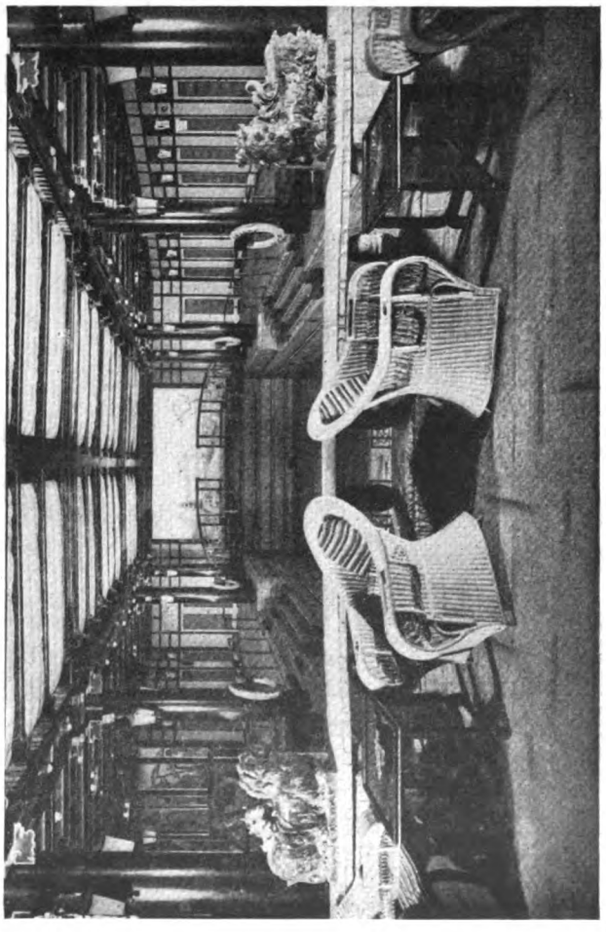
Smoking room



Writing room



Private dining room



Swimming pool

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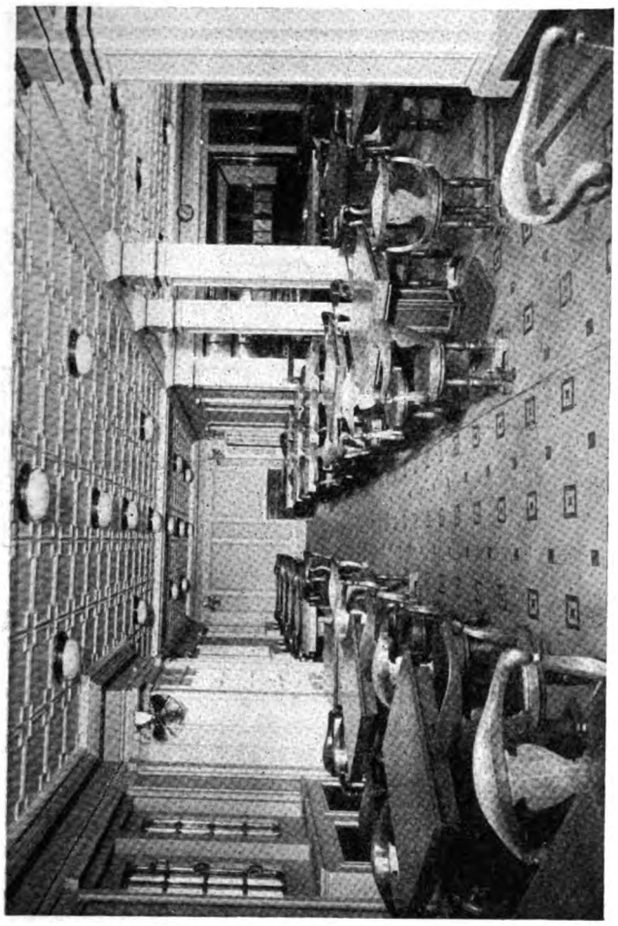
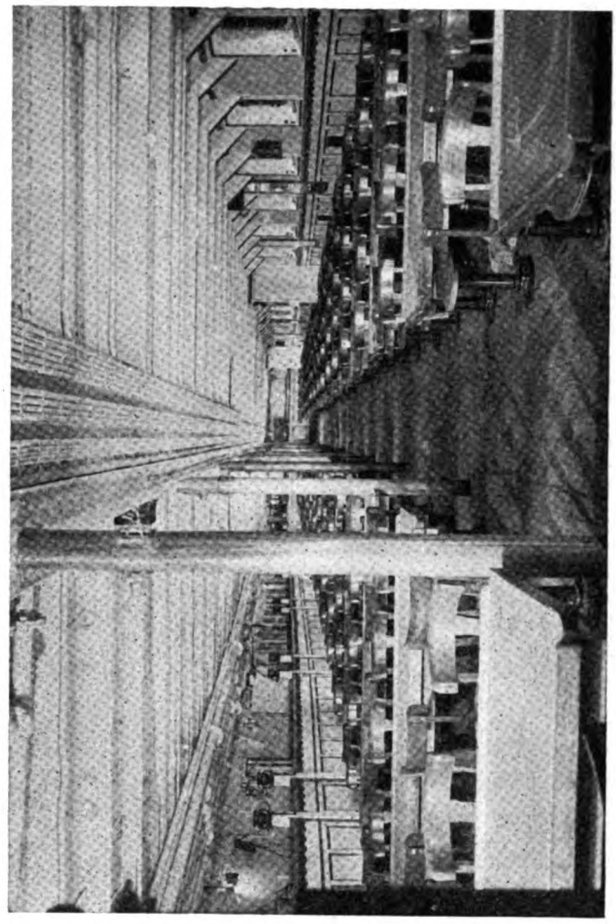
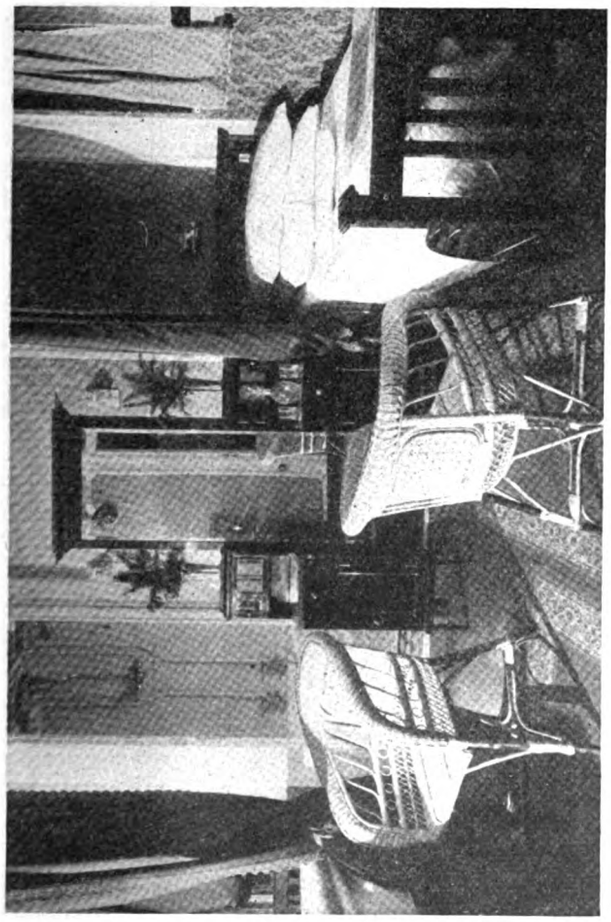


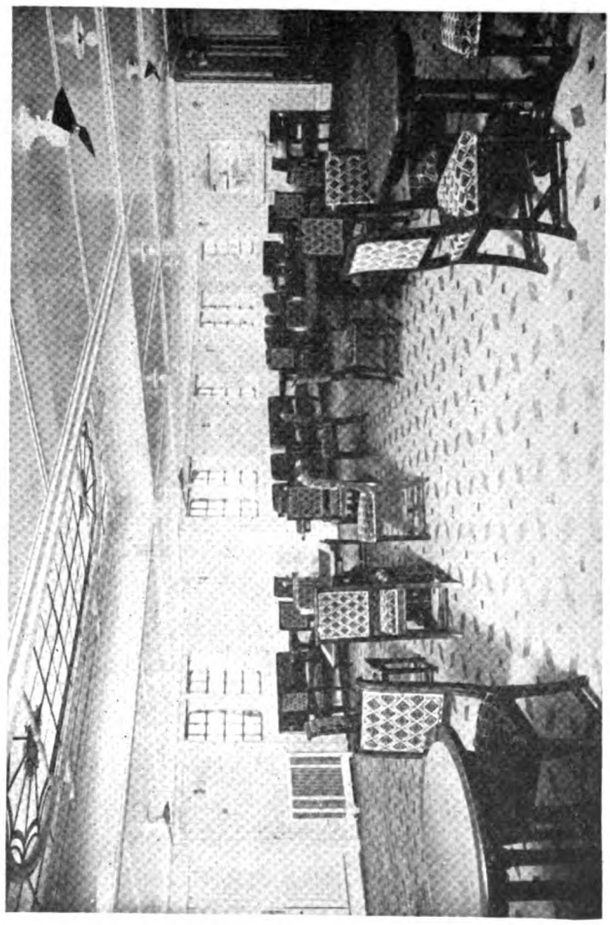
Second class dining room



Third class dining room



First class cabin



Second class smoking room

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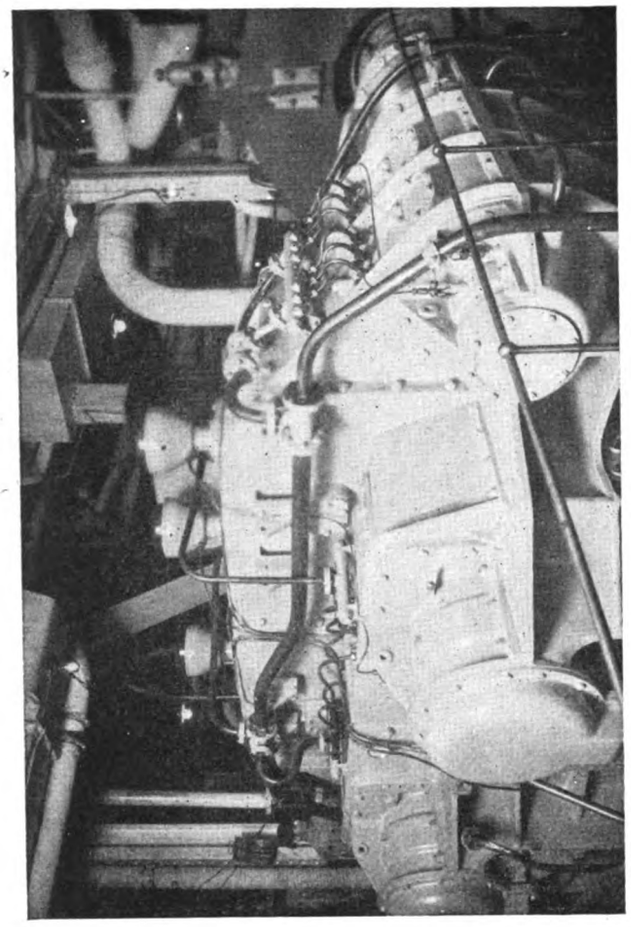
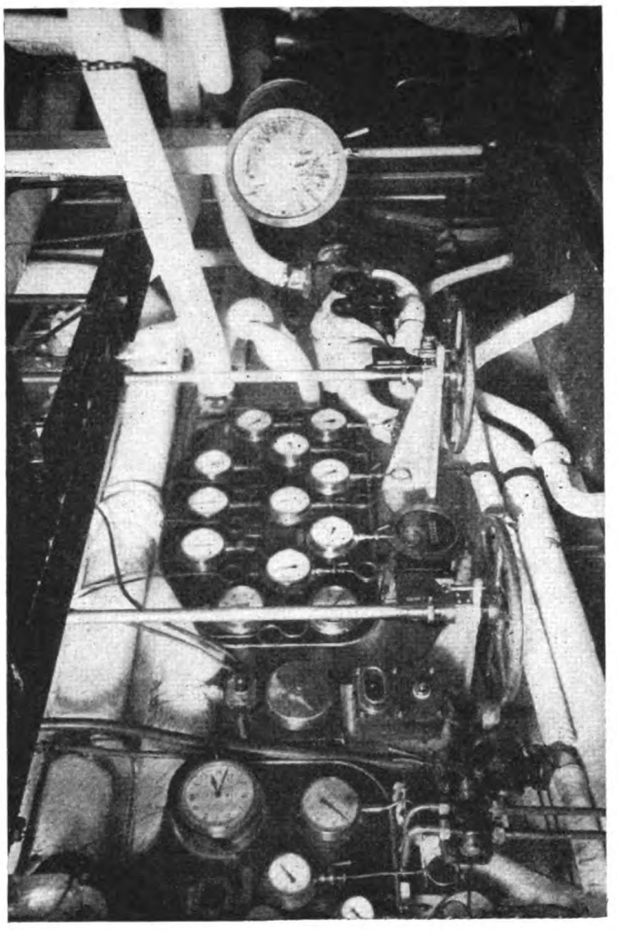
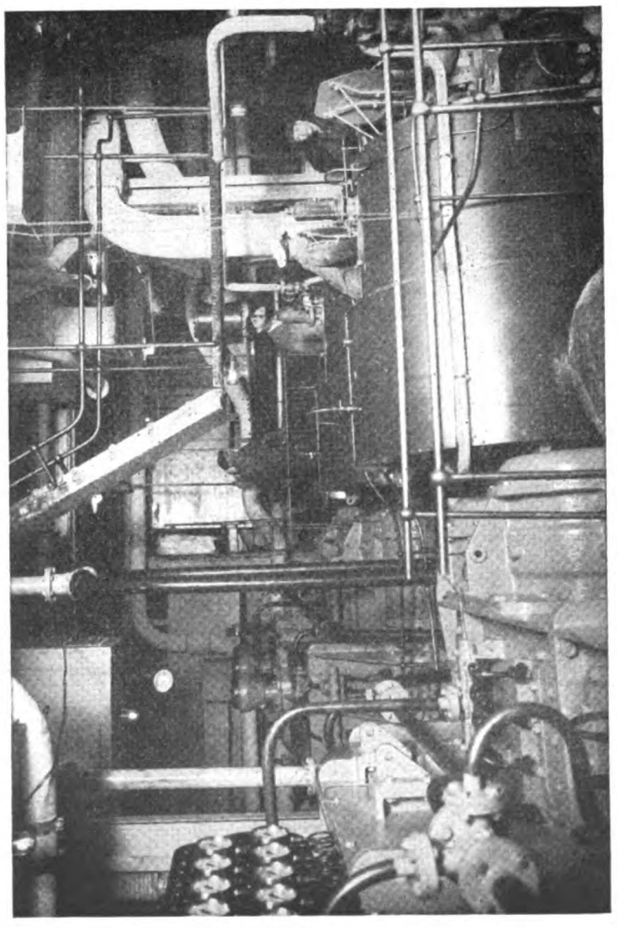


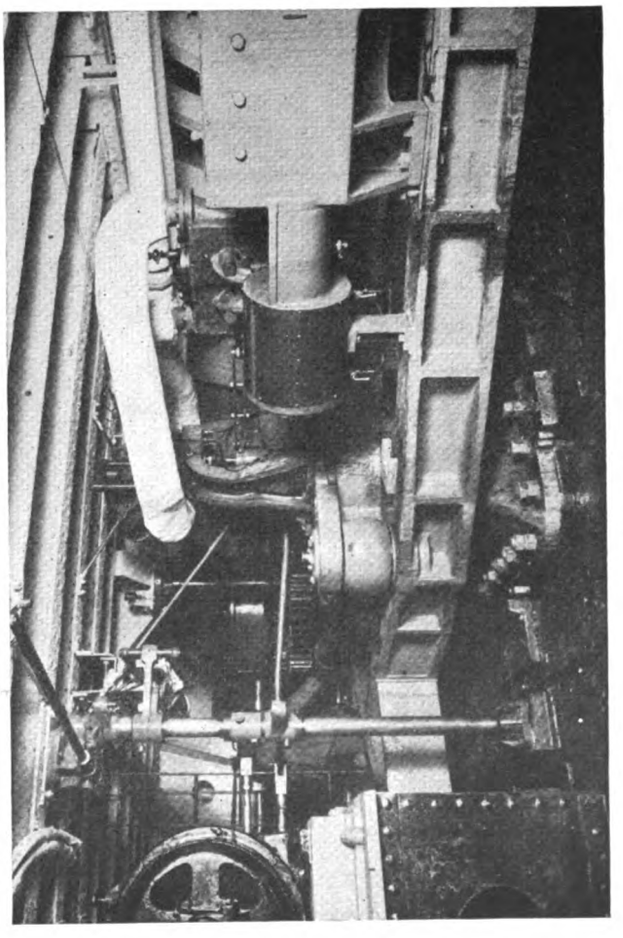
Reduction gear



Operating station



Main turbines



Steering gear

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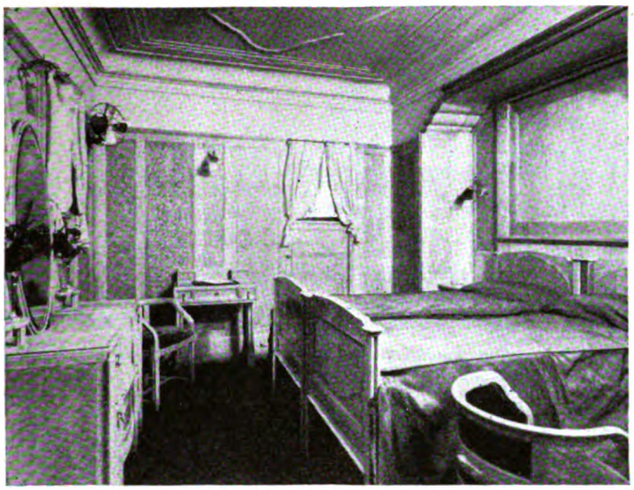


Bedroom of suite de luxe

Lounge of suite de luxe

stalled between the propeller shafts aft of the engine room.

The life saving equipment includes 39 lifeboats, two of which are motor boats. The lifeboats are handled under Welin davits while the motor boats are handled by Libani davits.

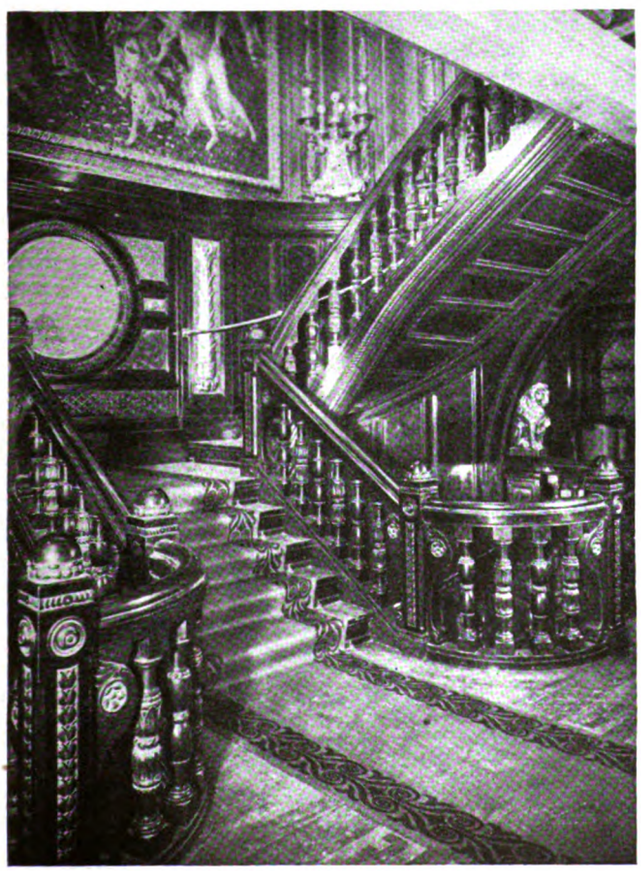
The first class accommodations are located on 4 decks amidships. The second class and second class intermediate are on 5 decks aft and the third class passengers are on 4 decks forward.

The first class accommodations include 23 de luxe cabins and 2 de luxe suites. Each of the de luxe cabins and also of the special first class cabins has a private bath. The furnishings, decorations and appointments are on a lavish scale as shown by the illustrations.

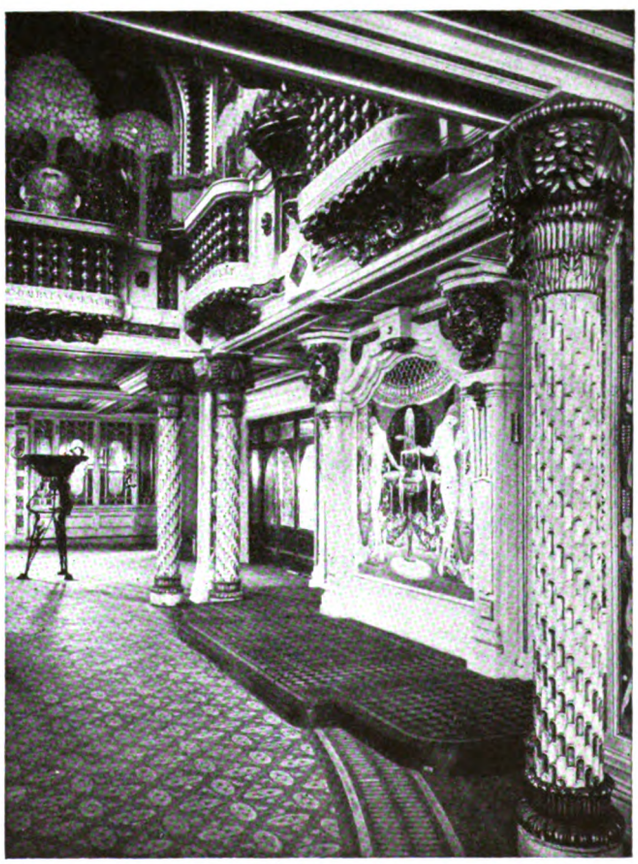
The public rooms are of special interest as 5 different decorative schemes have been adopted, each carried out by a celebrated architect or artist. A good idea of the manner in which these decorative schemes have been handled can be obtained from an inspection of the illustrations. The dining room and lounge are decorated in the Etruscan Roman style, the dancing hall is of the Renaissance period, the writing room of the English Elizabethan period, the smoking room in Dutch style and the swimming pool, which is exceptionally large, in Japanese style.

Propelling Machinery

Propulsion is by twin screws driven through double reduction gearing by two sets of compound turbines of



Main stairway



Entrance to dancing hall

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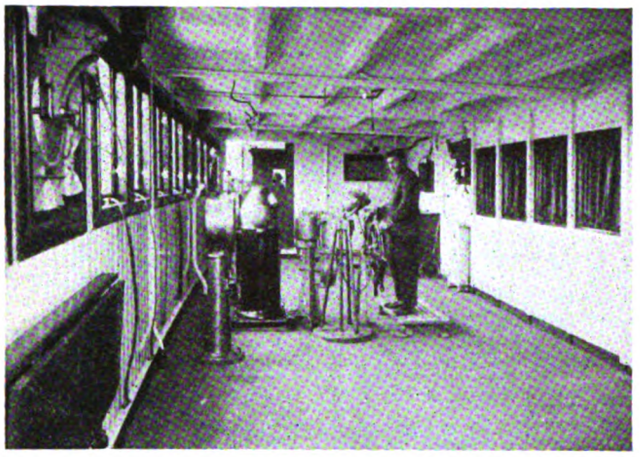


Bridge

the Parsons impulse reaction type. The machinery, which was built by the Stabilimento Tecnico Triestino, was designed to develop 26,000 horsepower at 105 revolutions per minute of the propellers. Each set consists of a high pressure impulse reaction turbine and a low pressure reaction turbine. In the forward ends of the low pressure casings are incorporated astern turbines of the impulse reaction type. The turbines are designed to work with a boiler pressure of 225 pounds per square inch and a steam temperature of 645 degrees Fahrenheit. The designed speed of the high pressure turbines is 3,070 revolutions per minute and of the low pressure turbines 1,650 revolutions per minute. These speeds were exceeded by 20 percent during steam trials of the machinery in the shop.

In order to increase the propulsive efficiency, the 4-bladed built-up propellers turn inboard and contra-propellers are fitted.

The main condensers are located directly under the low-pressure turbines, the auxiliary condenser is on the port side of the engine room.

The engine room is provided with two platforms, the upper platform is used as a main operating platform while from the lower platform access is obtained to the auxiliary machinery. The main circulating, air, feed and lubricating pumps are installed on the forward bulkhead, the other auxiliaries are arranged on the sides and on the aft bulkhead. Ventilation of the main engine room is effected by supply fans delivering air to the forward and after ends.

Auxiliaries

The auxiliaries, most of which were supplied by Messrs. A. Cerpelli & Company at La Spezia, include the following:

- 2 main centrifugal circulating pumps, with 27½-inch suction and discharge, driven by a tandem compound enclosed forced lubricated reciprocating engine with cylinders 11 and 17¾ inches diameter by 9 inches stroke
- 2 dual air pumps, each 33½ by 17¾ by 27¾ inches, driven by a steam cylinder 17¾ inches diameter by 17¾ inches stroke
- 3 main feed pumps, 21⅝ by 13¾ by 27½ inches
- 1 auxiliary feed pump, 10½ by 7 by 19¾ inches
- 4 forced lubricating pumps, each 10½ by 9 by 21⅝ inches
- 1 auxiliary air pump, 11¾ by 23½ by 15¾ inches
- 1 centrifugal circulating pump, with 13-inch suction and discharge, driven by a single cylinder enclosed forced lubricated reciprocating engine 7 inches diameter by 5½ inches stroke
- 2 vertical duplex bilge pumps, 7½ by 7 by 9⅞ inches
- 2 vertical duplex ballast pumps, 11½ by 11¾ by 11¾ inches
- 2 vertical duplex sanitary pumps, 11¾ by 11¾ by 11¾ inches
- 2 vertical duplex fresh water pumps, 7½ by 7 by 9⅞ inches
- 1 vertical duplex fire and deck wash pump, 11¾ by by 11¾ by 11¾ inches
- 1 vertical duplex drinking water pump, 4½ by 4½ by 7⅞ inches
- 1 service feed water heater of the multiflow type
- 2 oil coolers for forced lubrication
- 2 fresh water distillers of 25 tons capacity each
- 1 evaporator of 90 tons capacity
- 2 main feed water filters
- 1 auxiliary feed water filter
- 2 De Laval centrifugal oil purifiers

Boilers

Steam is supplied by 7 oil-fired, forced draft, double ended and two single ended 4-furnace boilers built by the Ansaldo Engineering Company at Genoa, and installed in two separate boiler rooms. The diameter of the boilers is 16 feet 6 inches; the double ended boilers being 22 feet long and the single ended boilers 11 feet 3 inches long; the total heating surface being 50,200 square feet. Each boiler is provided with a Schmidt superheater and Tompkins tangential dryers are fitted in the main steam pipes.

The Wallsend-Howden fuel oil burning system is used, supplied by the Wallsend Slipway and Engineering Company, Ltd. Each boiler room is provided with one set of fans, each consisting of two fans and 3 forced lubricated engines supplied by Messrs. A. Cerpelli & Company at La Spezia.

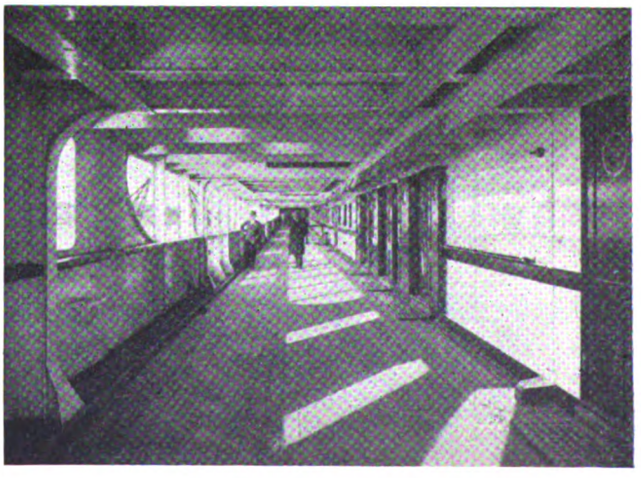
The fuel oil plant in each boiler room consists of 1 horizontal pump; 1 heater and filters; 2 fuel oil transfer pumps, 8¾ by 9 by 19¾ inches and 2 horizontal duplex cargo oil pumps 13¾ by 19¾ by 15¾ inches. Each boiler room is also fitted with 2 vertical duplex air ejector pumps, 11¾ by 7⅞ by 11¾ inches.

Electrical Plant

Electricity for all purposes is supplied by 3 turbo generators of 200 kilowatts each which are situated in the auxiliary engine room. The generators were supplied by the Cantiere Navale at Monfalcone. In addition there are two Diesel-driven emergency generators of 35 kilowatts each located on an upper deck.

The distribution of the electrical current is on the ring system of 110 volts. The current, both for power and for lighting, is controlled from a switchboard in the main engine room. Special circuits are provided for electricity during the stay in port and for emergency in connection with the Diesel-driven generators.

Separate generators and accumulators are provided to supply the electricity at 24 volts necessary for operating



Promenade deck

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the Sperry gyro compass, revolution indicators, broadcasting, etc.

For heating and ventilating the ship the Areo Mecanica Marelli of Milano has fitted 10 thermo tanks and 24 ventilators driven by electric motors of from 4 to 20 horsepower. The total power required for operating the various motors on the ship is about 840 kilowatts and the total number of electric lights installed is about 8,000.

Radio Direction Finding Shows Remarkable Growth

By Dr. F. A. Kolster*

DIRECTION finding by radio, the comparatively new art so important to the navigator at sea and the pilot in the air, made a long stride forward during the past year. Instead of 30 radio-beacon stations, which was the number approximately a year ago, the United States now has in operation along its coasts a total of 45 stations, and 12 more are under construction. This is an increase of 50 percent over the total of all previous years, since the first "radio fog signal" was established near New York in 1921. Special radio beacons for aviators are being constructed along air routes and were used with notable success on long distance test flights, even far out over the Pacific Ocean.

As there are about 81 beacon stations in operation over the world, the leadership of North America in establishing this system of aids to navigation is apparent. Canada has set up several along her coasts, which with the United States beacons form a fairly complete chain for the continent, from the Gulf of Mexico to Alaska and over the Great Lakes.

Over 1,000 Merchant Vessels Have Radio Compasses

The largest number of radio compass installations on board ships ever made in one year was recorded in 1927. In addition to a large number of naval vessels, it is estimated that more than a thousand commercial craft are now equipped with radio compasses, or direction finders, for getting their bearings by radio. About 600 of the total are American ships.

On the Great Lakes the first radio beacon station was established only two years ago; now there are 19 in operation on the United States and Canadian shores of Lake Michigan, Superior, Huron and Erie. Several hundred vessels and car ferries, a large proportion of the important shipping on the Lakes, are now using radio compasses.

Increased Efficiency in Transmission Sought

Tests are now being made by Commissioner George R. Putnam of the Bureau of Lighthouses to determine what increased efficiency in transmission can be had from staggering the wave lengths of adjacent stations. Originally all radio beacons were set at 1,000 meters. This developed the problem of separating two beacons transmitting at the same time within range of each other. Control clocks for synchronizing the broadcasting of beacon signals so they will not interfere are also being tried.

Most of the radio beacons use power of 200 watts or less, although they were first equipped to transmit at 500 watts. That power is now being used by only a few major stations, such as Nantucket, Diamond Shoal, San Francisco and others.

Commissioner Putnam declares that the radio compass is the most valuable navigational instrument brought out in recent years. Its remarkably increased use this past year testifies to the appreciation accorded it by the shipping world.

The cost of installing a radio beacon in a lighthouse or on a ship ranges from $3,000 to $12,000, including power units and with all apparatus in duplicate as a safety measure. But the cost of operating is small, since no increased personnel is required at the lighthouses. With the elaborate chain of radio beacons dotting the coast of the United States, 45 in operation, 12 being built, and plans for more being made continually, it has been found necessary to add to the lighthouse service only two radio engineers.

Mobile Radio Beacon

The mobile radio beacon now being built for use on all vessels is a development of the past year in the laboratories of Federal-Brandes, Inc. It is a small box placed in the pilot house and attached to the ship's electric mains. In thick weather a switch is turned and the box, which has a short aerial attached, begins to transmit an automatic radio signal of dots and dashes. Other ships within 10 miles hear the signals, locate them on the direction finder, and steer their courses without danger of colliding.

Visual Indicator Developed

A significant development in direction finding during the year was the addition of the visual indicator on the radio compass. This improvement allows the navigator to see the signals on his radio compass as clearly as if he were watching the light of a lighthouse. But the flashes may now come from a lighthouse several hundred miles away, and through the thickest storm or fog, day or night. In heavy weather, when his duties call him to other parts of the pilot house, the navigator can be summoned to the radio compass instantly by the winking of the signal light on the face of the instrument. It is no longer necessary to be on watch with ear phones. They are still used only to detect the faint sound of very distant signals which may be the weak call for help from a foundering ship.

* Inventor of the Kolster radio compass, founder of the U. S. Bureau of Standards radio laboratory and its chief for 10 years, now chief research engineer of Kolster Radio.

Shipbuilders to Study Plant Depreciation

RECOGNIZING the importance of standardizing the rates of depreciation and methods of applying them, the National Council of American Shipbuilders is co-operating with the United States Bureau of Internal Revenue to simplify and standardize the preparation and audit of shipyard tax returns involving deductions for depreciation of shipyard plant and equipment. For this purpose a committee has been appointed consisting of H. G. Smith, of the Bethlehem Shipbuilding Corporation Ltd., New York, and George H. Bates, of the Staten Island Shipbuilding Company, Staten Island, N. Y.

The committee is now making a study of plant depreciation, the special factors entering into it arising from war conditions and the methods observed by various yards in charging off depreciation. Upon completion of its survey, the committee will recommend for adoption by the bureau standard depreciation rates and methods for use by shipyards in the preparation of subsequent tax returns.

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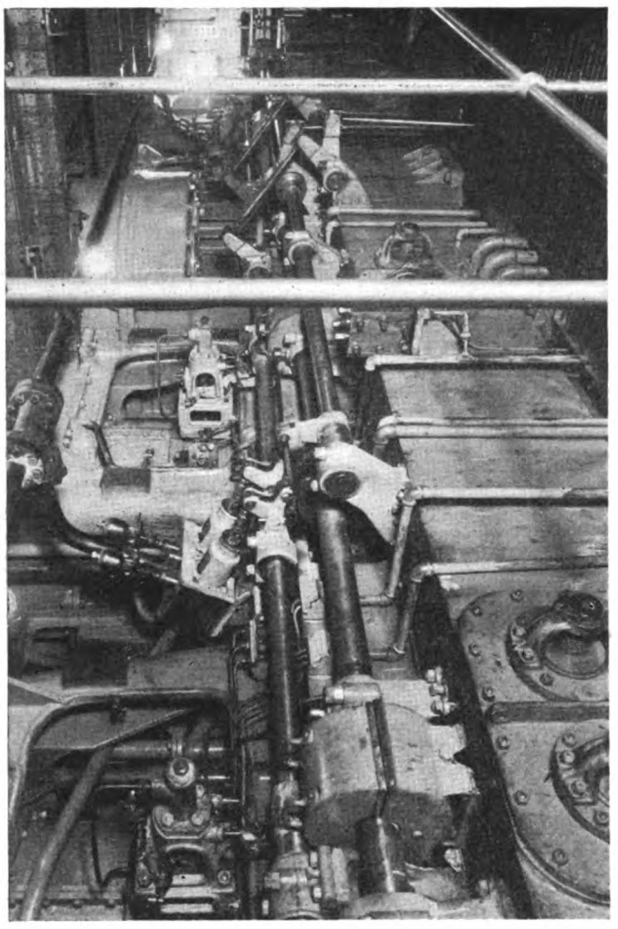
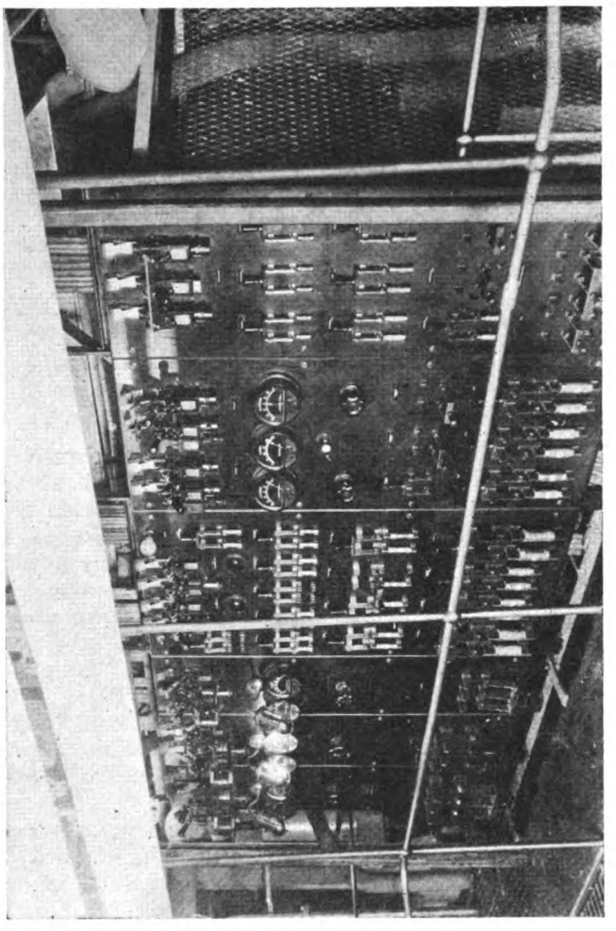
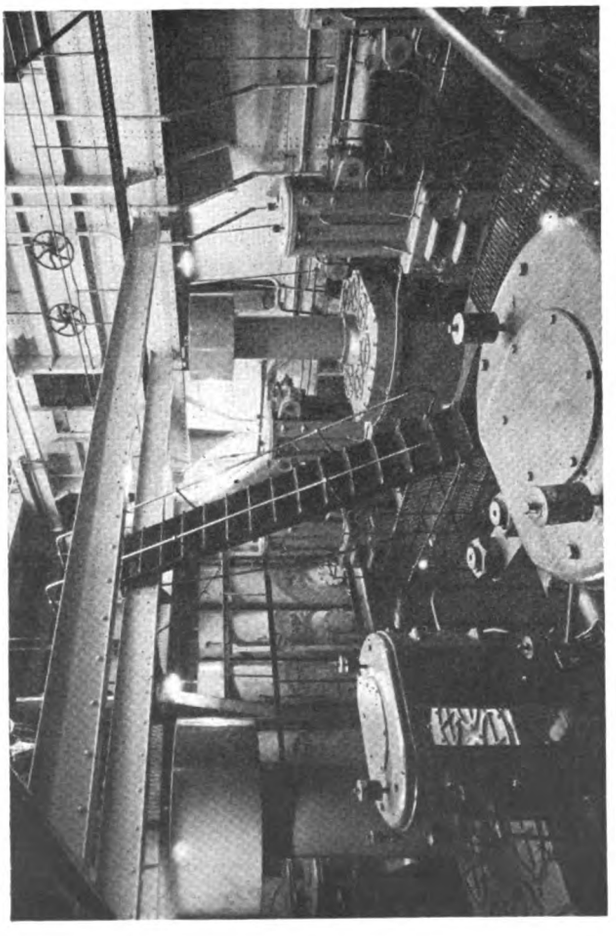


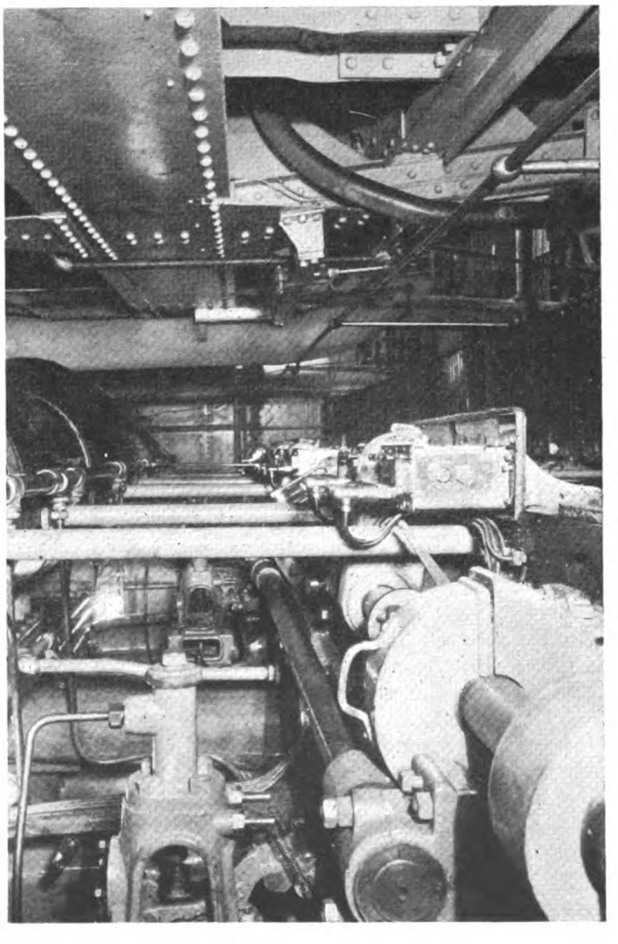
Center platform, showing cam shaft and fuel valves



Switchboard



Upper platform of engine room



Center outboard platform, showing Manzel lubricators

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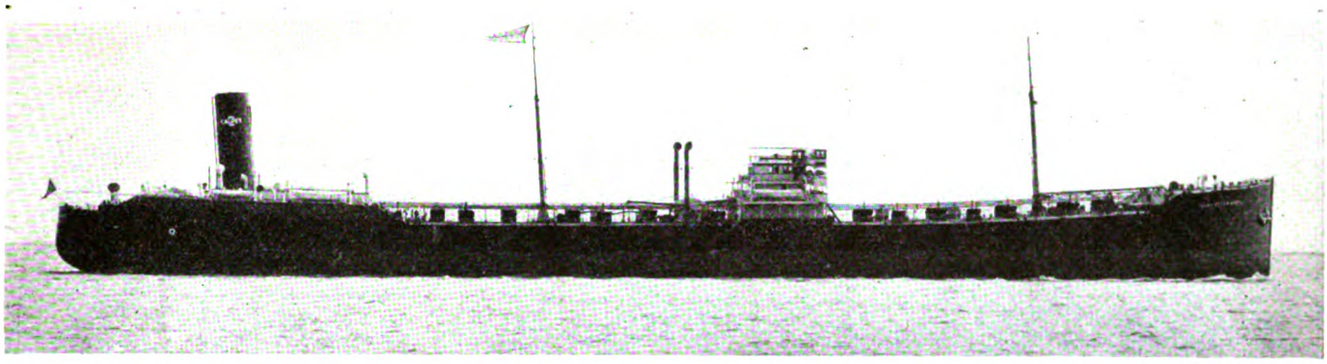


Motor tanker Mary Ellen O'Neil of 17,120 tons deadweight

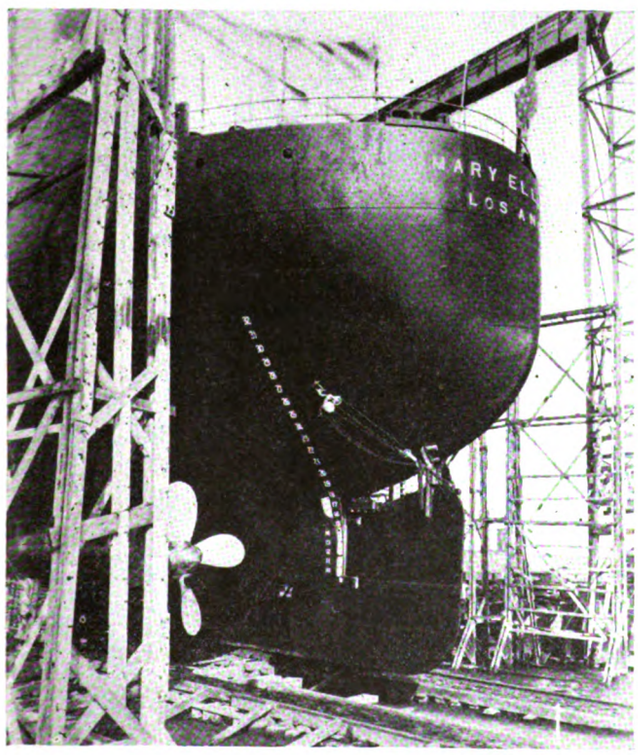
Motor Tanker Mary Ellen O'Neil

Sun-Doxford opposed piston Diesel engines installed in tanker develop 5,000 horsepower

NOTABLE among the ships recently completed in American yards is the 17,120-ton deadweight motor tanker *Mary Ellen O'Neil* built by the Sun Shipbuilding Company, Chester, Pa., for the California Petroleum Corporation, Los Angeles, Cal.

The characteristics of this vessel are as follows:

Length overall	530 feet 4 inches
Length on waterline	528 feet 6¾ inches
Beam, molded	70 feet 0 inches
Depth, molded	40 feet 0 inches
Designed draft	29 feet 6 inches
Displacement	24,000 tons
Deadweight carrying capacity	17,120 tons
Cargo hold capacity	78,095 cubic feet
Cargo tank capacity, about	5,900,000 gallons
Fuel oil	1,500 tons
Indicated horsepower	5,000
Speed	11½ knots



View of stern, showing balanced rudder

The hull of the tanker was built to the highest classification of the American Bureau of Shipping according to the Isherwood bracketless system of construction. As indicated by the plans, the profile of this tanker is a departure from the conventional in tanker design. The effect was brought about by the straight stem in combination with a cruiser stern. However, the poop, forecastle and house amidships follow typical bulk oil freighter practice. These accommodations are all connected by gangways along the centerline of the ship.

In the arrangement of the hull, modern oil tanker design has been closely followed. The main pump room is located amidships between No. 6 and No. 7 tanks. Forward under the forecastle is located a miscellaneous cargo hold. A longitudinal oiltight bulkhead, extending along the centerline from the forward hold to the machinery space aft, together with a number of transverse bulkheads divide the oil cargo space into 20 main tanks and 12 summer tanks.

The cargo handling arrangements include two masts fore and aft and two king posts amidships adjacent to the pump room. Each of these is fitted with two 5-ton cargo booms. These booms are served by deck winches, one located at each of the masts and one at the king posts. In addition, the deck machinery includes a windlass located under the forecastle deck, two capstans on the forecastle deck and two capstans on the upper deck astern. The tanker is fitted with a semi-floating, streamline, balanced rudder actuated by hydro electric steering engines located aft.

Crew Accommodations

The house amidships is arranged in 3 decks with the flying bridge surmounting the superstructure. Next below is the navigating bridge which includes the wheel house and the chart room. Below this are the captain's quarters consisting of an office, a stateroom, bath and lobby. The deck officers' staterooms are on the main deck of this amidship house, where also are located the radio room, infirmary and smoking room or lounge, which replaces the customary mess room.

The space in the forecastle is devoted to carpenter's and boatswain's stores. Crew accommodations, including all but the deck officers, are situated in the poop. The chief engineer's suite, which is located forward on

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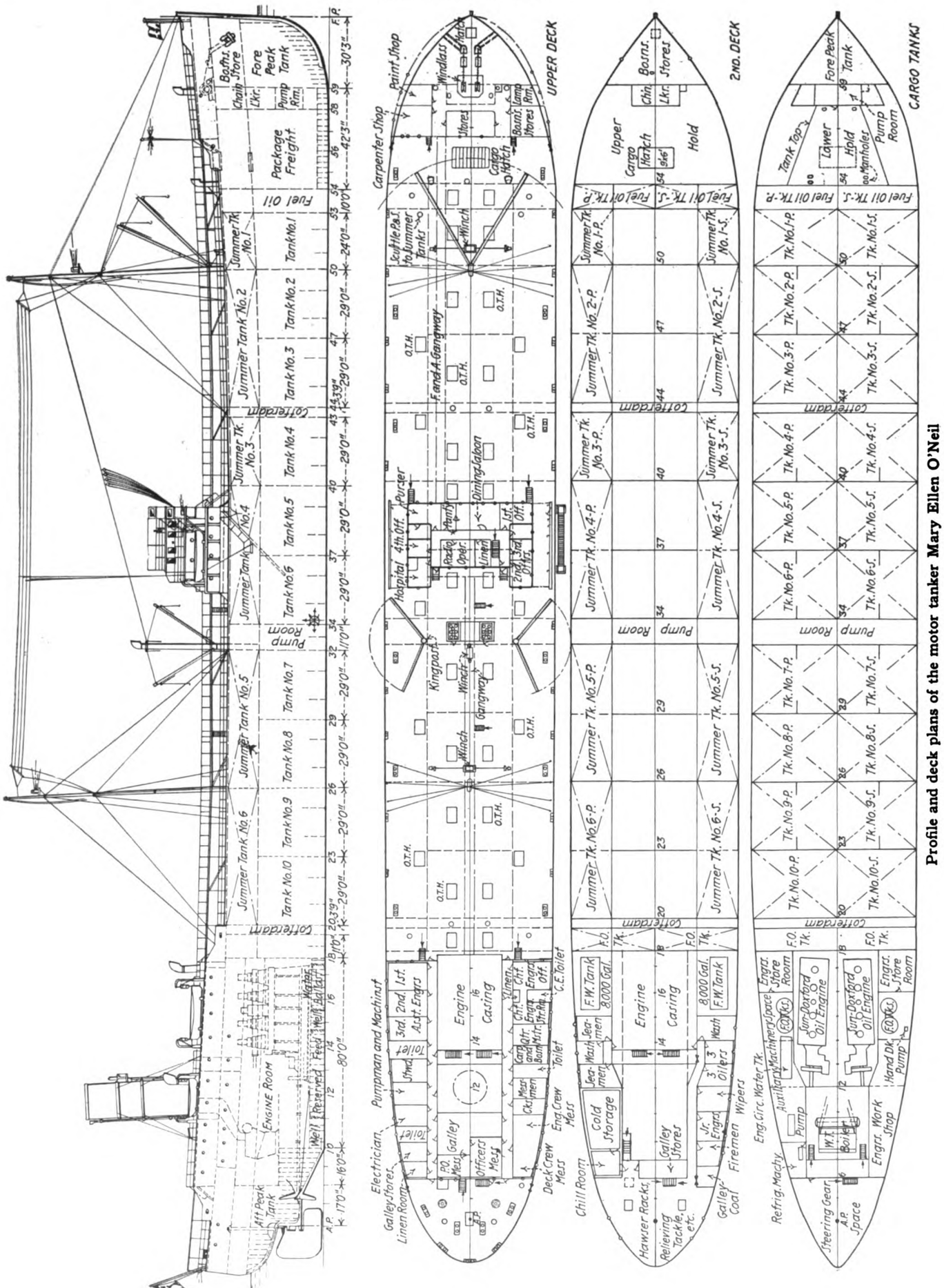

Profile and deck plans of the motor tanker Mary Ellen O'Neil

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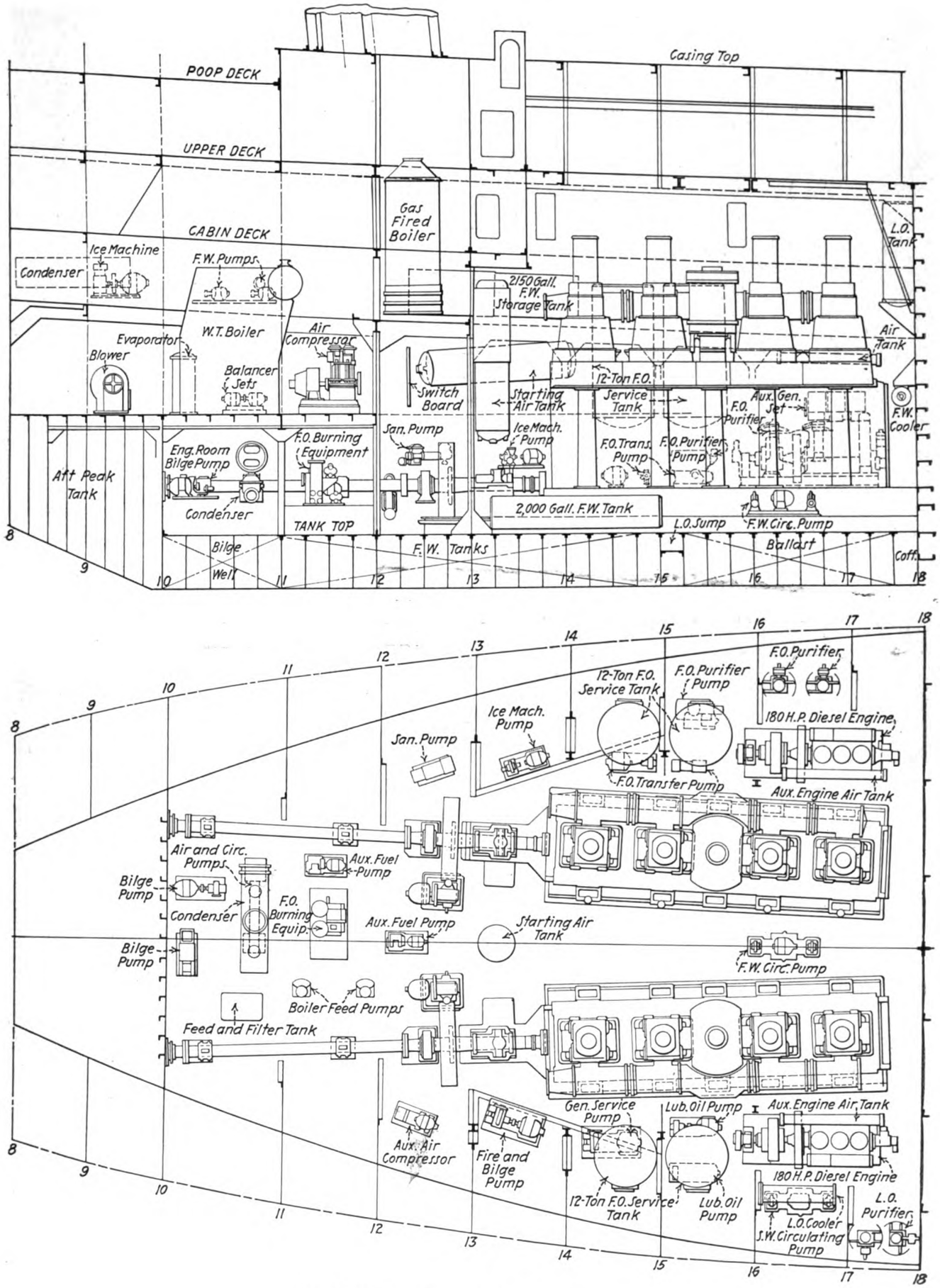

Longitudinal section and plan of engine room

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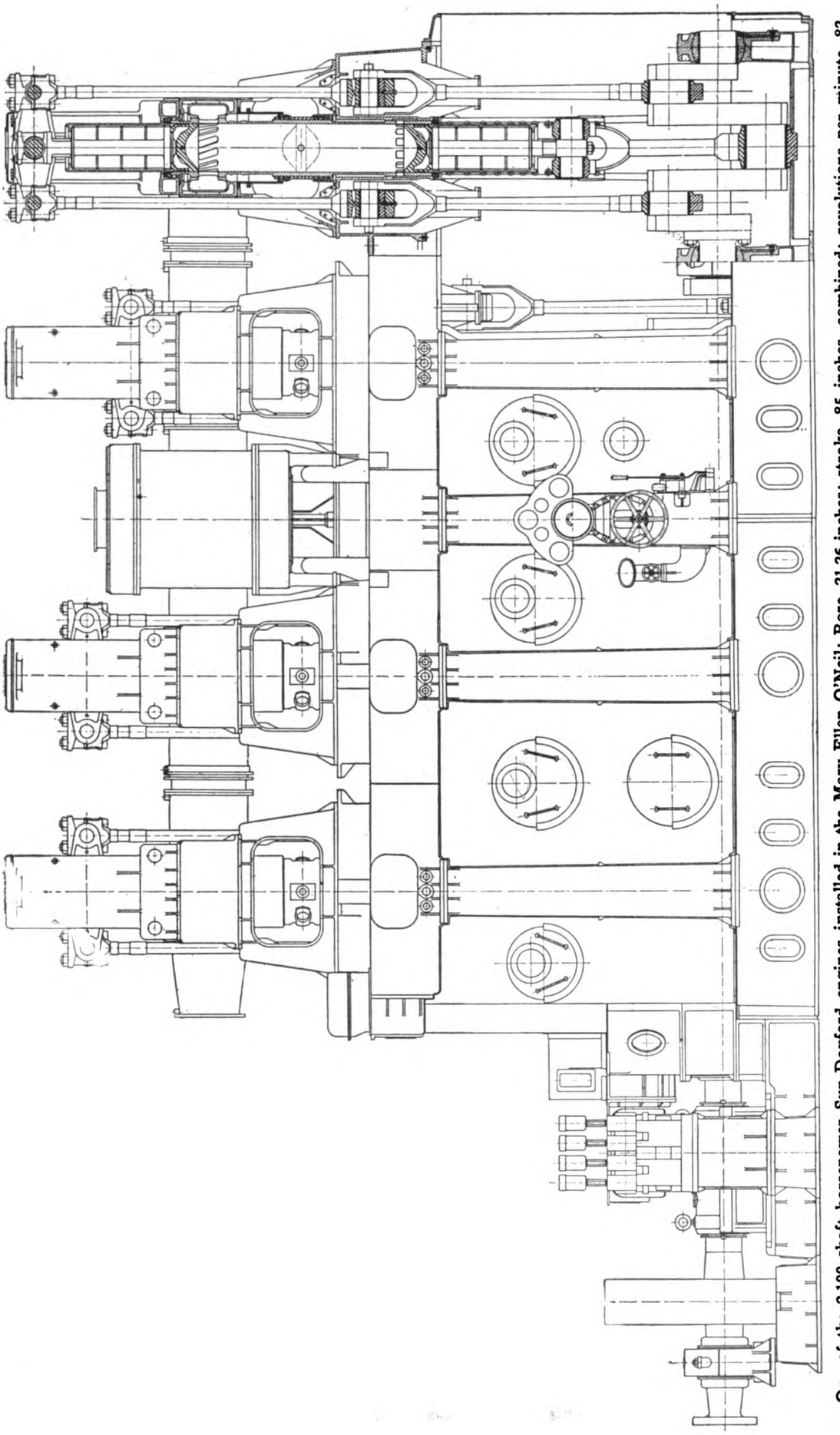

One of the 2,100 shaft horsepower Sun-Doxford engines installed in the Mary Ellen O'Neil: Bore, 21.26 inches; stroke, 85 inches, combined; revolutions per minute, 82

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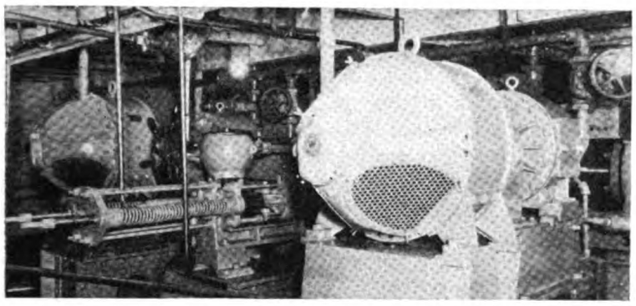
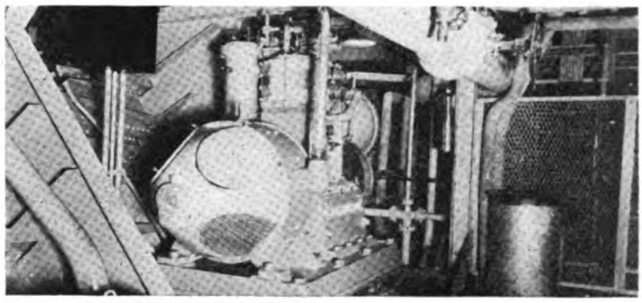


Steering gear



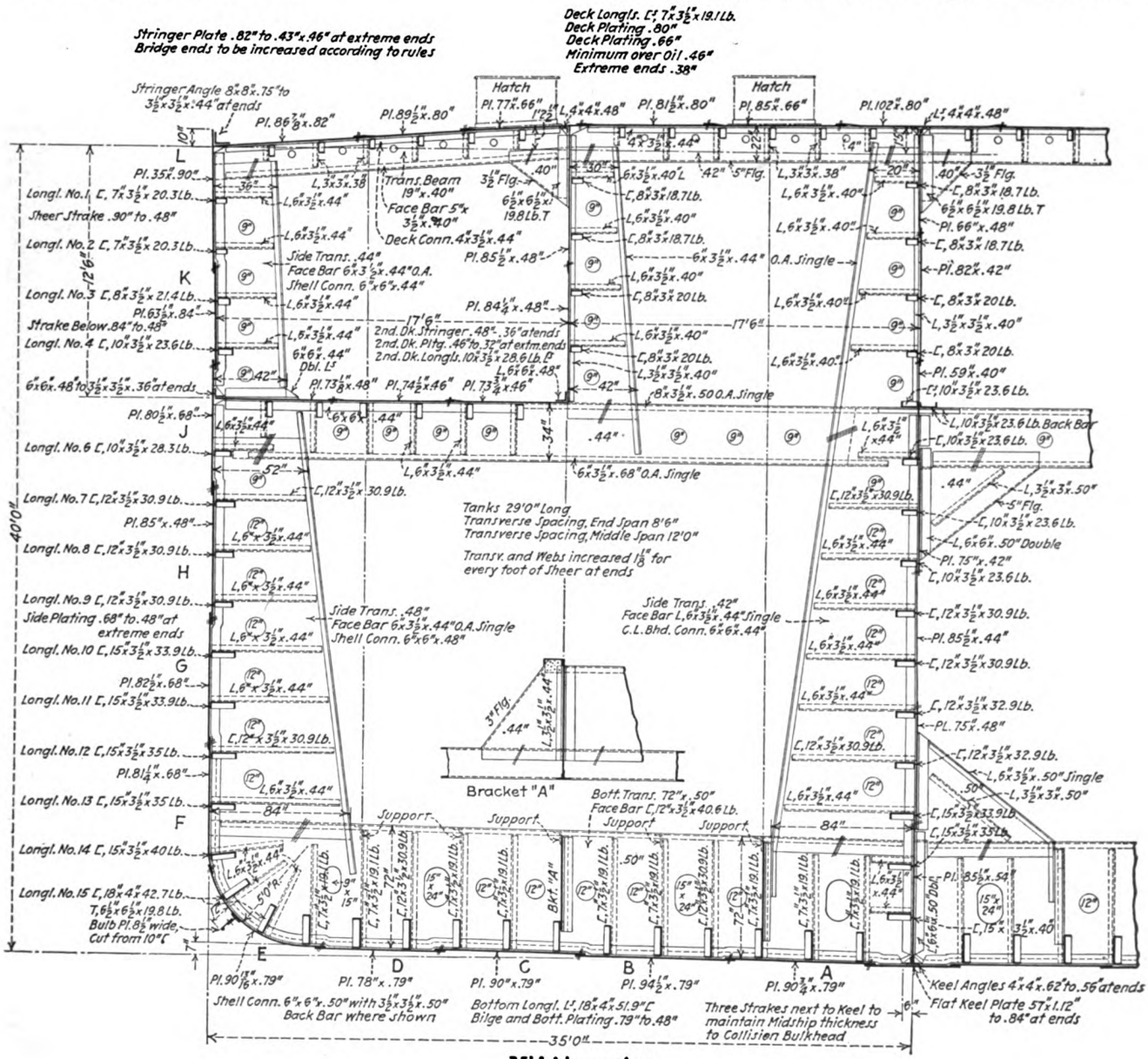
Maneuvering air compressor

the port side of the poop, includes an office, bath and stateroom. Aft of the chief engineer's quarters are rooms for the quartermasters, carpenter and boatswain, mess men, cooks and mess rooms for both the engine room staff and the deck crew. On the port side are single rooms for the first, second and third assistant engineers; for the steward, pump man and machinists, electrician, galley stores and linen room. On the centerline aft of the main engine casing are the officers' mess and petty officers' mess.

Cold storage rooms, having about 3,000 cubic feet capacity, are located on the deck below where also are quarters for the engine room and deck crews with wash rooms and other accommodations.

Propelling Machinery

The *Mary Ellen O'Neil* is fitted with twin Sun-Doxford Diesel engines built by the Sun Shipbuilding Company under Doxford license. Each of the main engines develops 2,100 shaft horsepower at 82 revolu-



Midship section

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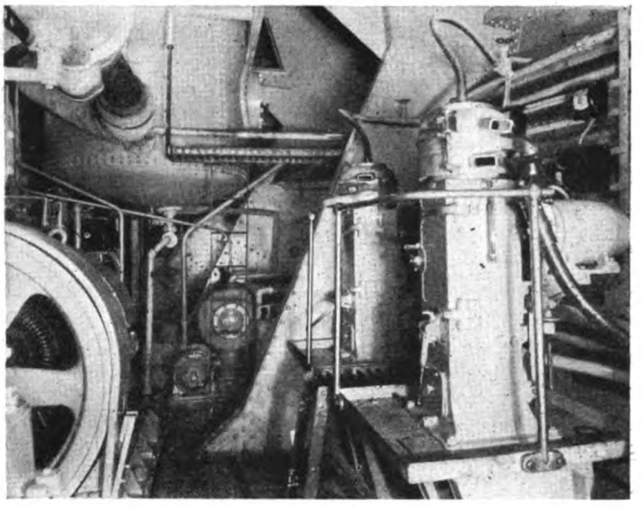


National Acme oil separators

tions per minute giving the ship its required speed of 11½ knots, although on her trial trip a speed of 12.26 knots was attained. This particular engine, which works on the 2 cycle opposed piston system, has 4 cylinders each 21.26 inches in diameter with a combined stroke of 85 inches. Fuel is supplied by airless injection, the fuel pump being located at the after end of each engine. This pump operates at pressures from 1,500 to 10,000 pounds per square inch depending on the revolutions required. Scavenging air is supplied by a pump direct connected to the crank shaft of each engine and located between the second and third cylinders of each unit.

A forced feed system of lubrication supplies oil at 30 pounds per square inch pressure to the main bearings, crank pin bearings, crosshead guides and thrust blocks. Oil coolers are installed for maintaining the lubricating oil at the correct temperature and a National Acme centrifugal oil purifier is also included in the equipment. Special Manzel force feed oilers driven by silent chains from the rear cam shaft of each engine are used to lubricate the cylinders.

Auxiliary Machinery

The auxiliary machinery includes two Worthington 180 horsepower Diesel engines each driving a 120-kilowatt Westinghouse direct current generator. Air for the 3 main starting tanks is supplied by two Worthington 3-stage air compressors, each operated by a 65 horsepower Westinghouse motor having push button control at the operating platform. An auxiliary air compressor, driven by a 5 horsepower motor, supplies air for emergency purposes. Nearly all motors and controls for auxiliaries are of Westinghouse make.

On a flat located aft of the main engines is located a Foster marine watertube boiler having a heating surface of 4,000 square feet and equipped with 4 Todd oil burners. This boiler is used for heating the oil cargo in the main and summer tanks and to supply steam at 200 pounds per square inch working pressure to the various steam driven deck units and to the main cargo pumps. At sea all engine room auxiliaries and steering gear are motor driven, but while the vessel is discharging or loading cargo in port, steam pumps and a steam driven electric generator are used. This generator is a 20-kilowatt Westinghouse machine delivering current at 240 volts. The equipment also includes a Westinghouse 60 ampere balancer set for stepping the 240-volt current down to 115 volts.

The two main fuel oil starting pumps of Watson-Stillman manufacture driven by Westinghouse motors are capable of maintaining a pressure of 4,000 pounds per square inch at the main engine fuel valves. These pumps are controlled by push buttons at the maneuvering platform of each engine.

The refrigerating set installed on the *Mary Ellen O'Neil* consists of a 2½-ton Brunswick ice machine operated by a Westinghouse motor direct connected to a compressor. This set serves refrigerating coils in the ice box and chill room as well as cooling a 40-gallon scuttle butt.

Propelling Machinery

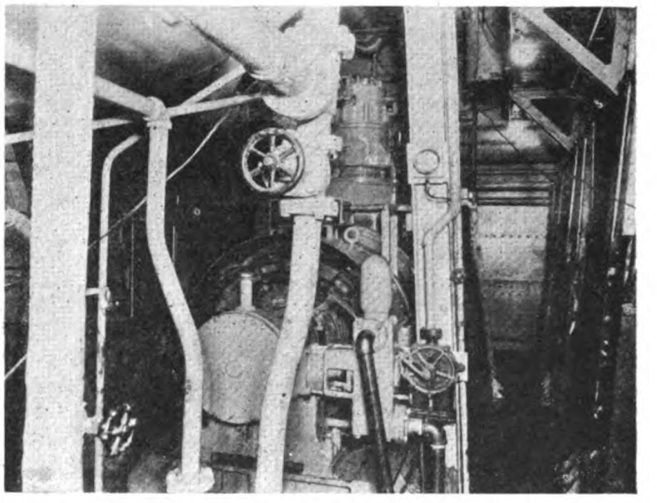
2 main Diesel engines, Sun-Doxford, 2,100 shaft horsepower
2 Worthington 3-stage main air compressors
1 Worthington auxiliary compressor
2 double acting scavenging pumps, connected to main engine
2 fuel oil injection pumps attached to main engines

Generating Sets

2 3-cylinder 180 horsepower Worthington Diesel engines connected to 120-kilowatt Westinghouse generators
1 20-kilowatt steam-driven Westinghouse generator set

Steam Plant

1 Foster watertube donkey boiler, 200 pounds per square inch working pressure
2 Sun Shipbuilding Company exhaust gas-fired, waste heat boilers



Auxiliary generator set

1 Griscom-Russell feed water heater, 20,000 gallons per hour capacity
1 Worthington shell type condenser
2 Griscom-Russell lubricating oil coolers, 200 gallons per minute capacity each
2 Griscom-Russell jacket type fresh water coolers, 300 gallons per minute capacity each
1 evaporator 16 tons capacity per 24 hours

Motor Driven Pumps

2 Worthington rotary type lubricating oil pumps, 200 gallons per minute
2 Worthington fresh water rotary type cooling pumps, 50 gallons per minute
2 Worthington fresh water centrifugal type circulating pumps, 750 gallons per minute
2 Worthington centrifugal type salt water cooling pumps, 750 gallons per minute
1 Worthington centrifugal type fire and general service pump, 200 gallons per minute
1 Worthington centrifugal type fire, bilge, ballast and emergency salt water pumps, 200 gallons per minute
1 Worthington rotary type engine room bilge pump, 200 gallons per minute
1 Worthington rotary type fuel oil transfer pump, 200 gallons per minute

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2 Watson-Stillman reciprocating type starting fuel oil pumps, 4,000 pounds per square inch pressure at engine valves
2 rotary type lubricating oil pumps, 200 gallons per minute
1 Worthington centrifugal type sanitary and ice machine pump, 200 gallons per minute

Steam Pumps

2 Worthington vertical simplex boiler feed pumps, 10 inches by 7 inches by 24 inches
1 Worthington horizontal duplex fuel oil transfer pump, 6 inches by 5¾ inches by 6 inches.
2 Worthington main cargo pumps, 12 inches by 20 inches by 13 inches by 24 inches
1 Worthington horizontal duplex engine room bilge pump, 7½ inches by 6 inches by 10 inches.
1 Worthington horizontal duplex pump room bilge pump, 7½ inches by 6 inches by 10 inches
1 Worthington horizontal duplex pump room bilge pump, 6 inches by 5¾ inches by 6 inches
1 Worthington horizontal duplex forward pump room fuel oil transfer pump, 7½ inches by 6 inches by 10 inches
1 Worthington combined air and circulating pump, 12 inches by 14 inches by 14 inches by 12 inches
1 Worthington horizontal duplex sanitary and ice machine pump, 7½ inches by 6 inches by 10 inches.

Miscellaneous

1 American Engineering hydro-electric steering gear, Hele-Shaw reversible pump
1 Brunswick-Kroeschell 2½-ton ice machine
2 National Acme fuel oil separators
2 National Acme lubricating oil separators

A Method of Improving Back Pressure Valves

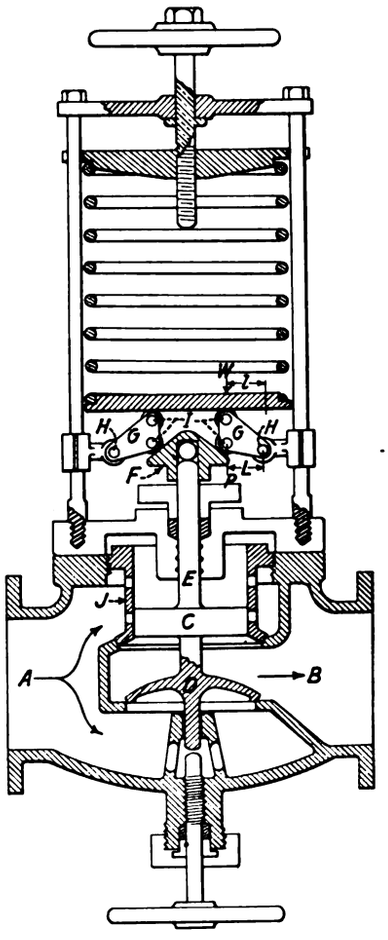
By Lt.-Comdr. C. J. Odend'hal, U. S. C. G.

IT HAS been my experience as an engineer officer and the experience of every other engineer with whom I have discussed the matter, that maintaining constant back pressure with the valves ordinarily installed for that purpose is an impossibility. Back pressure valves are as a rule designed with a single valve disk, the stem of which is direct connected to the bottom of the spring. Any change in pressure or vacuum on the discharge side of this valve has the same effect as changing the spring tension with consequent change of the back pressure. Furthermore, any increase in the volume of exhaust steam to be handled will cause the back pressure to rise. Then to maintain a steady back pressure with this type of valve, it is necessary to keep the pressure in the condenser constant as well as the quantity of exhaust steam. Any change of either will affect the back pressure.

The valve should be balanced to make it independent of the discharge pressure and to prevent leakage of air through its stuffing box to the condenser; and the load tending to shut the valve should decrease as the valve lifts to compensate for the drop in pressure under the valve by virtue of the flow of steam. The further the valve is off its seat, the greater the drop in pressure directly under the valve. With the valve stem connected to the bottom of the spring, as mentioned above, the spring tension increases with the lift of the valve. Whereas, before the additional lift of the valve the spring tension and steam pressure were balanced, to open the valve further necessitates an increase in the exhaust steam pressure. Not only must this pressure rise to compensate for increased spring tension, but also to make up for drop in pressure under the valve by virtue of the steam there being in motion.

To overcome the difficulties of the old type back pressure valve, a modified valve has been developed and successfully tried out on the U. S. C. G. destroyer *Conyngham*. In the accompanying illustration of this valve, piston *C* and valve disk *D* have the same areas.

Pressure of the condenser in *B* does not affect the operation. Steam pressures over piston *C* and under valve disk *D* are equal. This pressure usually is maintained between 5 and 10 pounds. The upward thrust



Section through valve

tending to open the valve depends upon the difference in areas of *C* and *D* which is the area of the valve stem *E*. The upward thrust then equals the exhaust pressure which is, as stated, 5 or 10 pounds times the area of valve stem. To balance this there is a spiral spring the bottom plate of which rests on top rollers *I*, transmitting its thrust to the cap on the top of the valve stem about the pivot *H* or lever *G*. Lever *G* is composed of side plates, a pivot journal *H* and two rollers *I*.

As the valve stem rises, the top roller will swing in an arc about *H* shortening the distance *l*. The bottom roller will practically rise in a vertical line and the distance *L* is practically a constant. Letting *W* = pressure exerted by the spring on each of the top rollers, *W'*, *W"* successive spring pressures as valve lifts, and *l*, *l' and l"* length of lever from bearing point of spring on the roller to pivot *H*, and each successive length of lever as valve rises:

$$Wl > W'l' > W''l'', \text{ etc.}$$

As stated, it is necessary that the thrust exerted by the spring should decrease to compensate for the drop in pressure of steam directly under the valve as the valve opens.

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$(PL = Wl) > (P'L' = W'l') > (P''L'' = W''l'')$, etc.

As the spring is only required to balance the exhaust pressure times the area of the valve stem which is about 10 pounds total, it is made very light. All of the structure above the bonnet is made of light parts. Friction of moving parts is far below that met with in the valves of the old design. The greatest friction would be between the valve stem and the stuffing box. It will be noted that the stuffing box is made very deep. The lower section is grooved to form a water seal, the upper section being shallow to hold two turns of packing. It is believed that the water seal will practically stop all leakage, as the pressure to be held is as a rule never above 10 pounds. Two turns of metallic packing above the water seal will effectively prevent any leakage of steam and the stuffing box as a whole will offer little opposition to a free movement of the valve stem through it.

Another advantage of making the stuffing box long as shown is to provide a stop for limiting the opening of the valve. The illustration shows piston *C* slightly smaller than *D* with a separate cylinder *J*. This design provides a greater upward thrust of the steam with consequent sturdier spring. This would only be necessary if there were appreciable friction in the stuffing box.

As this valve though balanced is single ported, there is a decided movement of the valve stem for each variation in volume of steam to be handled. This in itself would prevent sticking as well as the type stuffing box mentioned. Cylinder *J* was made detachable to provide a means of removing the valve *D* which, as stated, is larger in diameter than *C*. Making *C* and *D* of the same diameter would not require this refinement. If it is desired to provide a heavier superstructure than that obtained with the piston and valve disk of the same diameter, a better method than having these parts of different diameters would be to pipe steam from the inlet side of the valve to the space over the piston *C* and maintain this space at atmospheric pressure. The spring required with this arrangement would be heavier than the one in which pressures over *C* and under *D* are equal, but not as heavy as in the old type of back pressure valve in which the pressure over the valve disk is the same as the absolute pressure corresponding to the vacuum in the condenser.

Balanced Valves

There are valves on the market which are balanced with unusually long springs, guaranteeing a regulation within about 5 pounds. The mechanism interposed between the valve stem and spring as described above gives the effect of a spring of infinite length. A spring of infinite length, however, would maintain a constant spring tension at all positions of the valve. It has been shown that a gradual reduction of spring tension is required as the valve lifts. As the levers will accomplish this, a closer regulation can be kept with an interposed mechanism and a very short spring than with a spring of infinite length. Other valves on the market are balanced and double ported using a diaphragm to eliminate the stuffing box and to maintain a constant downward thrust. The drawback to a double ported valve is the slight movement required to affect regulation. By virtue of this small movement the valve will eventually stick and become erratic. Diaphragms, too, crack or break and become inoperative. The valve described has been designed to move decidedly with each increment of volume of steam, with a stuffing box so designed as to offer little friction to a free movement of the valve stem. The levers are made of sufficient strength without undue size to wear for an indefinite period without replacement. An unusually deep stuffing box with the lower section a water seal and the upper section packed with 2 turns, over even 1 turn of a metallic packing without joint, such as the John Crane's, would offer little opposition to a free movement of the valve stem and would wear but slightly.

The back pressure valve installed on the U. S. C. G. destroyer *Conyngham*, which was fitted with a single valve disk of the old design, was modified by the writer as far as the superstructure was concerned. The illustration shows brackets to which the levers are pivoted secured to the uprights. This illustration shows but 2 of these uprights, whereas to keep the stem centrally located there should be 3 or 4. The *Conyngham's* valve had but 2 of these uprights, so 3 brackets for pivoting levers were secured to the bonnet instead of to the uprights. The rest of the mechanism was installed, as shown. Of course, as the valve was not balanced, any variation in vacuum would require a new spring setting, but outside of this the modified valve maintained a back pressure practically constant. Before the alteration, 30 pounds rise of back pressure was not uncommon, but after the modification 4 pounds rise was excessive, the usual rise not being over 1 pound. When it is considered the spring was unusually heavy and stiff and the mechanism home-made, it can readily be conceived what the regulation would be with a properly designed and manufactured article.

The interposed mechanism described would be used to advantage with balanced reducing valves, being the same design as the back pressure valves with the exception of valve disk *D* which would open downward; with relief valves for maintaining constant pressure in lubricating and fuel oil lines; and in fact with any valve required to function in a reliable and efficient manner.

SHIPBUILDING DECLINES.—Since the beginning of 1928 there has been a decrease of nearly a quarter of a million gross tons in the volume of merchant vessels being constructed in shipyards of the world, according to a statement just issued by Lloyd's Register of Shipping. This is the first time that there has been a decrease shown in the quarterly returns since September, 1926. In comparison with the 1926 figure, however, which was 1,850,000 gross tons, the total at March 31, last shows an increase of 1,043,000 tons. The present aggregate, however, is nearly 270,000 tons below the level just prior to the war, at the end of June, 1914. A sharp decline since the first of the year is shown by the returns for the shipyards of the United States, only 56,000 gross tons of merchant vessels on which work has been begun being reported at the end of March, as compared with 97,000 tons at the opening of the year. As a result, this country, which then ranked eighth in the volume of production, now stands tenth; both Russia and Japan having passed her in the period under review. Gains in the volume of work during the past quarter are reported by Lloyd's only for Denmark, Russia and Japan, the latter country showing the largest proportionate gain; and the return for the United States showing the largest proportionate loss. Tanker steamers and motor tankers, of 1,000 gross tons and above, now in hand aggregate 107,000 tons less than at the beginning of this year. Motorship construction shared in the general decline of the last quarter, but more than 50 percent of the world construction consists of motorships.

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The Motor Yacht Savarona

Largest Diesel engine powered yacht afloat has a cruising radius of 11,000 miles

WHEN the Diesel yacht *Savarona* was placed in commission in March by her owner Richard M. Cadwalader, Jr., of Philadelphia, the event marked a definite advance in the technique of yacht construction. Not only is the *Savarona* the largest Diesel powered yacht yet built but in the luxury of her appointments ranks with the finest yachts afloat.

The design for the *Savarona* was made by the firm of Henry J. Gielow, Inc., naval architects, New York city, and the yacht was built by the Pusey & Jones Company, Wilmington, Del., under the supervision of the designers. The general particulars of the *Savarona* are as follows:

Length overall	294 feet
Length on load waterline	280 feet
Beam	38 feet 3 inches
Draft	16 feet

The *Savarona* is of the full bodied, molded type of hull with full displacement carried forward and aft having easy entrance and exit lines. This characteristic of easy lines is strongly in evidence when the yacht is driving at her required speed of 16 knots. At this speed practically no bow wave is set up and the wake is barely noticeable. The combination of a plumb stem, short overhang at the stern and a straight sheer gives the profile a pleasing appearance.

Accommodations

With a view of making the *Savarona* a floating home for periods of long duration, the treatment of the accommodations carries out the impression of a fine town house. The interior decorations throughout the yacht are of the XVIIIth century French period. The paneling, architectural detail, furniture, ornamental and decorative iron work were designed by Mrs. Renner of New York city. The owner's and guests' quarters are of large size and the last word in the luxury of their appointments. The living room and the drawing room are each 26 feet square and are lighted by large observation windows. The owner's suite consists of a sitting room, stateroom, two bath rooms, a dressing room and a maid's room. The guest quarters on the cabin deck consist of 7 double staterooms and one single stateroom, each with its private bath.

At the forward end of the upper deck is an observation room 18 feet square which provides an unobstructed view on 3 sides. At the after end of the upper deck is a lounge finished in teak which opens into the deck shelter and the after deck. One interesting indication of the extent to which the town house idea has been carried is the Estey organ installation in the forward end of the after deck house. Tone openings for the organ are provided in the living room and in the main lobby. The console is located in the upper main lobby.

To provide a maximum degree of stability in all kinds of weather, the yacht has been fitted with a Sperry gyroscope which was built by the Westinghouse Electric & Manufacturing Company at the South Philadelphia Works. On her trial trip the yacht encountered extremely heavy weather, but the log of the trip indicates that a maximum roll of 12 degrees was reduced to zero when the gyroscope was put into operation. The yacht is completely equipped with life saving apparatus, fire extinguishers and two 28-foot lifeboats, one of which is motorized. The small boat equipment also includes a 30-foot launch, a 26-foot high-speed boat and a crew's launch 26 feet in length.

Main Propelling Machinery

The main propelling plant consists of two 8-cylinder Bessemer Diesel engines direct connected to twin screws. Each engine develops 1,500 brake horsepower and has cylinder diameters of 18 inches and a stroke of 22 inches. The full power rating is attained at 300 revolutions per minute.

Three auxiliary generating sets are installed, two of which are of 110 kilowatts capacity and one of 40 kilowatts capacity. These units consist of Bessemer oil engines driving Westinghouse generators. Two Ingersoll-Rand motor driven compressors having a delivery capacity of 26 cubic feet per minute at 350 pounds per square inch pressure are used to supply air to the main air line header where it is distributed to starting tanks, whistle tank and the like.

The yacht is heated, cooled, ventilated and humidified by the Thermofan system, a product of Venitherm & Company, Inc., Newark, N. J. This system takes air from the outside, screens and cleans it and passes it over heating or cooling coils depending on the temperature desired, after which it is distributed through ducts and registers to all quarters of the ship. There are two of these units having a delivery capacity of 4,000 cubic feet of air per minute at 2½ inches water pressure. This system will heat the yacht to 75 degrees Fahrenheit at zero degrees Fahrenheit outside temperature or cool the air to within 5 degrees Fahrenheit of the sea water temperature. Steam for this system is furnished by an oil fired boiler working at a pressure of 15 pounds per square inch. This boiler also supplies steam to the heating coils in the lubricating oil tanks and for direct heating in the pilot house, chart room and captain's quarters.

A 3½ ton per 24 hours capacity evaporator and distiller made by Schutte & Koerting is also operated from the boiler.

Fresh hot water is supplied through the sanitary system by an American Radiator Corporation boiler fitted with a Ray oil burner.

The refrigerating plant is a Remington 2-cylinder motor driven ammonia machine which is used for cooling a storage space of 600 cubic feet in the galley and pantry and 200 cubic feet in the hold. The machine will also freeze 300 pounds of ice per day.

The steering gear is a Hyde hydro-electric machine controlled mechanically and electrically from the pilot house. Two 4,000-pound anchors were supplied by the Baldt Anchor Chain & Forge Company and the anchor chain by the American Chain Company. An Edison storage battery of 900 ampere hour capacity is located in the upper engine room. Two Cory 3-panel switchboards are installed on the metal grating in the engine room.

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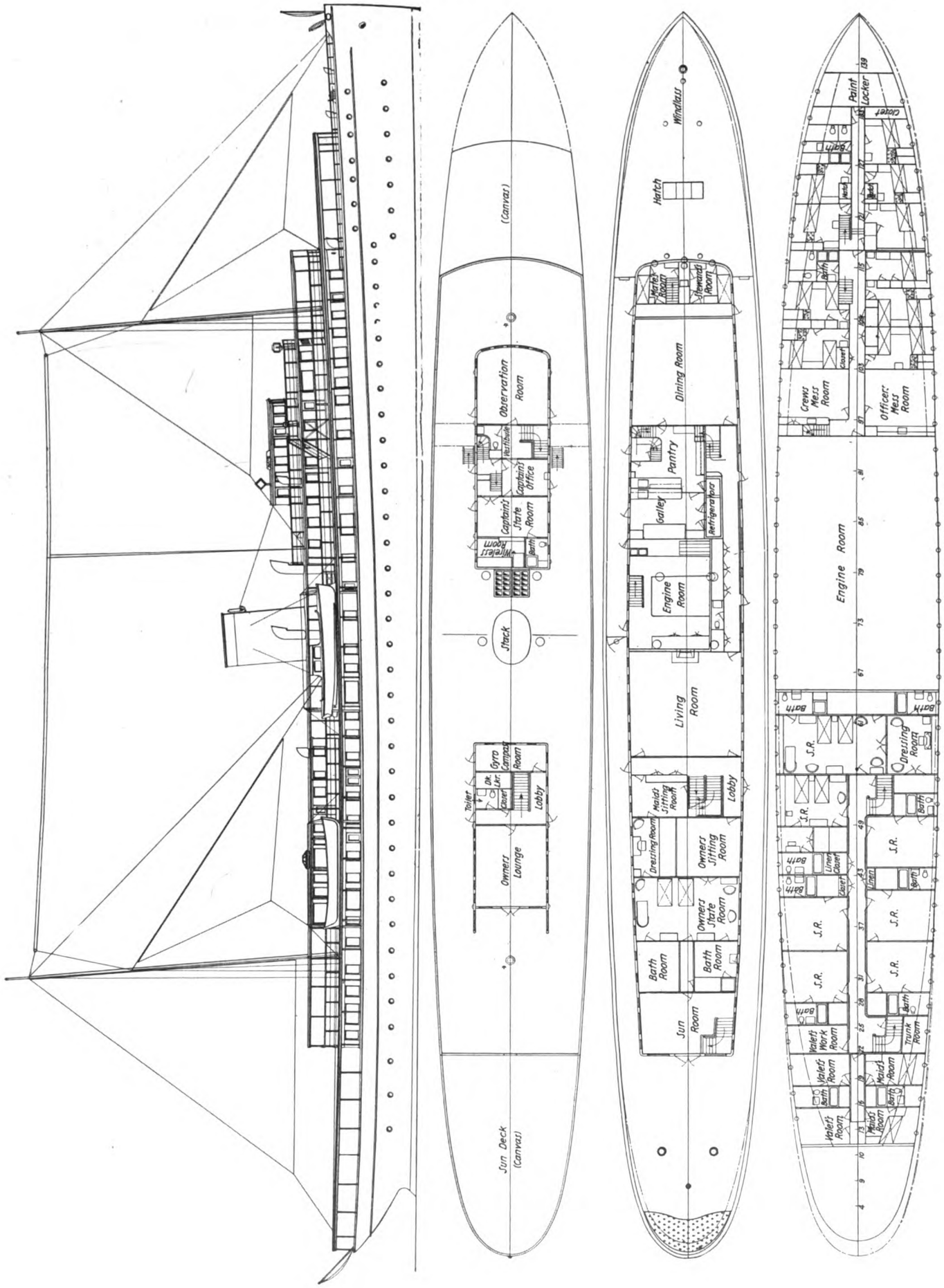

Profile and deck plans of the Diesel yacht Savarona

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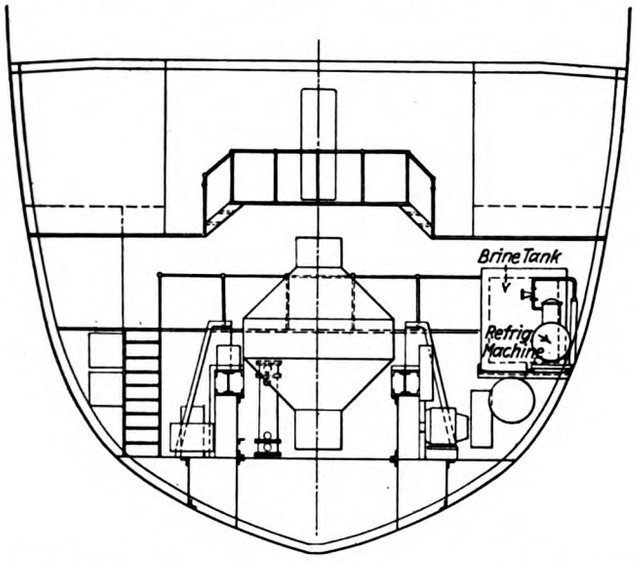
A Kolster radio direction finder, a Radio Corporation of America wireless set, Submarine Signal Company fathometer, Sperry gyro compass with 4 repeaters, Sperry revolution and direction indicators in the engine room and pilot house, helm angle indicator, and a gyro pilot are all included in the very complete equipment of this yacht.

The windlass is a Hyde 35 horsepower double vertical capstan fitted for 1⅝-inch stud link chain and is



Section through engine room at frame 90, showing gyro stabilizer

capable of lifting both anchors and 30 fathoms of chain at once. The boat hoists are two Hyde 15 horsepower motor-driven double capstan type capable of lifting 5,000 pounds at 100 feet per minute. An American Engineering Company warping capstan with 7,000 pounds pull at 30 feet per minute located on the after deck completes the deck machinery. The *Savarona* is also fitted with Goodrich cutless rubber strut bearings.

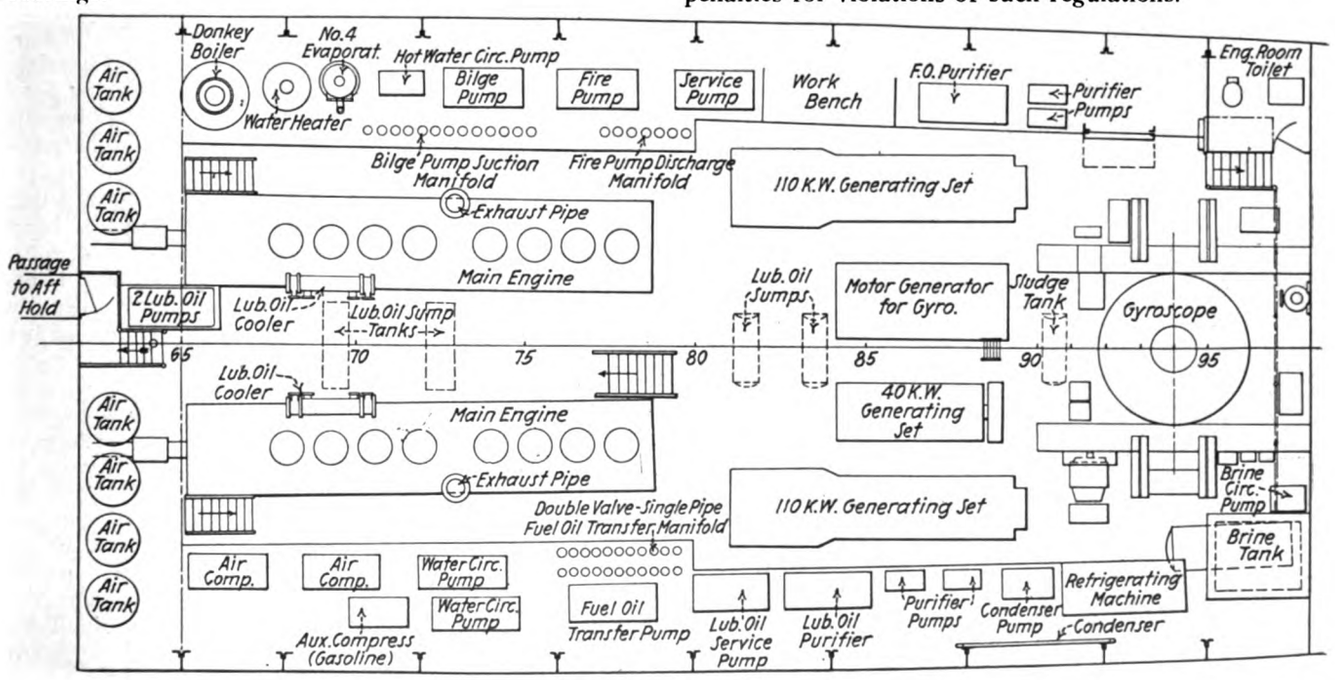
The pump equipment aboard the *Savarona* includes the following:

2 De Laval centrifugal water circulating pumps, 300 gallons per minute capacity
2 Northern Fire Apparatus Company lubricating oil pumps, 175 gallons per minute capacity
2 Schutte & Koerting lubricating oil coolers
1 Northern Fire Apparatus Company fuel oil transfer pump, capacity 60 gallons per minute
1 Northern Fire Apparatus Company lubricating oil transfer pump, capacity 30 gallons per minute
2 De Laval No. 360 oil separators, one for fuel oil and one for lubricating oil
1 Northern Fire Apparatus Company bilge pump, capacity 100 gallons per minute
1 Northern Fire Apparatus Company fire pump, capacity 100 gallons per minute
1 Northern Fire Apparatus Company service pump, capacity 100 gallons per minute
Walter Kidde & Company Lux CO_2 fire protection system
2 Kewanee salt and fresh water pumps
1 Thomas sewage sump pump

Shipbuilders Appoint Representative for Load Line Committee

THE National Council of American Shipbuilders has designated H. C. Towle, of the Bethlehem Shipbuilding Corporation, Ltd., New York, as its representative on the committee now being organized by the secretary of commerce to study load line legislation for American vessels with the view of making recommendations for appropriate legislation. It is expected that the steamship owners, the Shipping Board, the American Bureau of Shipping and the marine underwriters will also appoint representatives.

The Senate Commerce Committee has favorably reported to the Senate the Jones Bill (S. 1781) authorizing the secretary of commerce to establish by regulations, in general accordance with the practice of principal maritime nations, the load water lines for American cargo carrying vessels of 250 gross tons or over, engaged in foreign trade and for similar vessels of other nations clearing from American ports. The bill also provides penalties for violations of such regulations.



Plan of engine room

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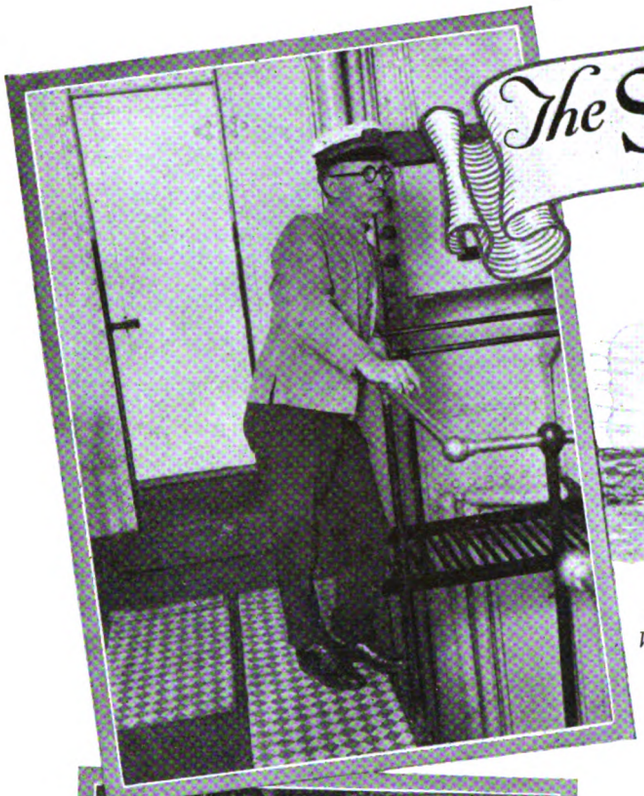
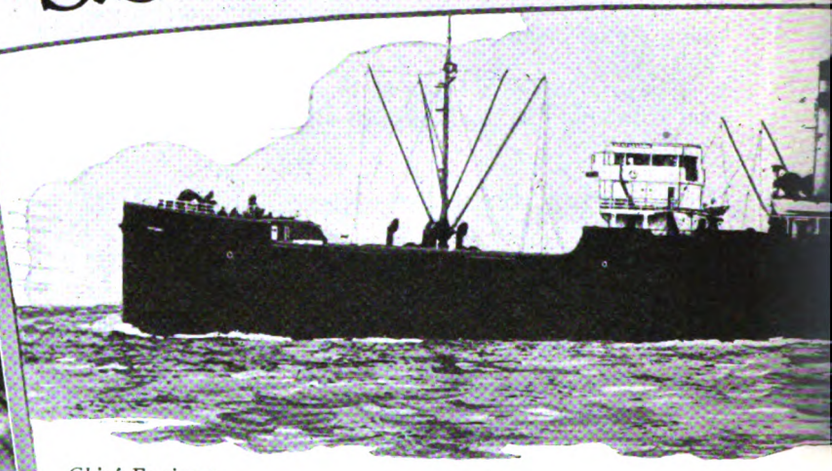
The S.S. Westerner Has



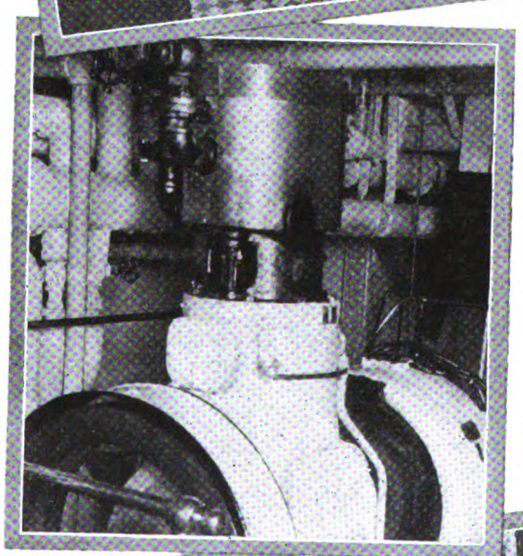
Chief Engineer W. F. Woodcock



THE steamship *Westerner,* owned by the United States Shipping Board, has obtained a remarkable rating in efficiency during the past 5 years. Since early in 1923 she has been operated on the American Diamond Lines by the Black Diamond Steamship Corporation. Her run has been between North Atlantic ports in the United States and ports in Belgium and Holland and despite the bad weather experienced on the North Atlantic her record has been exceptionally good.

Besides New York, Philadelphia and Baltimore, calls are made to meet cargo requirements at Portland, Boston, Norfolk and Newport News on this side of the Atlantic.

The *Westerner* was completed in February, 1918 at the yard of J. F. Duthie & Company, Seattle, Wash. She has a deadweight of 8,618 tons, a length overall of 423 feet 9 inches, length between perpendiculars, 410 feet 5½ inches, beam 54 feet and depth 30 feet 2½ inches. She is equipped with 3 Scotch boilers with a total heating surface of 8,055 square feet. Oil is used for fuel. She is propelled by a 2,500 horsepower General Electric turbine through General Electric gears.

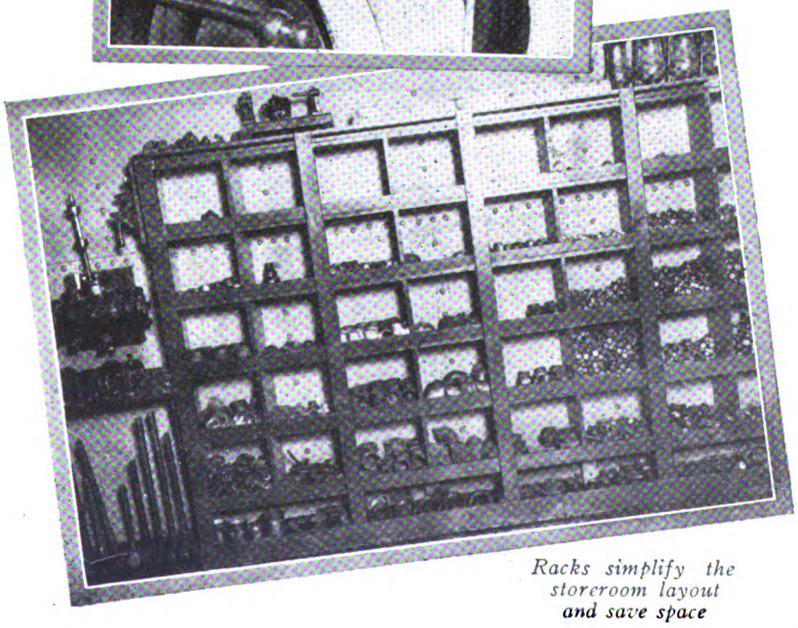


Even the generators are capped with brass

Ten years ago her record was not unusual. She was the same as many ships of her class. Her efficiency was low and her fuel consumption was high. In fact she burned 113.88 barrels of oil per 100 miles on her maiden voyage, as compared with 76.51 barrels of oil per 100 miles on her last voyage.

Since her operation on the American Diamond Lines, her efficiency has constantly increased. With the exception of her first voyage she has maintained high averages of efficiency. Her maintenance costs have been low and, in all, she is a better ship today than she was five years ago, when she entered the service of the American Diamond Lines.

In this five years of service she has never had a breakdown of machinery with the exception of the first voyage, and the maintenance costs have been negligible.



Racks simplify the storeroom layout and save space

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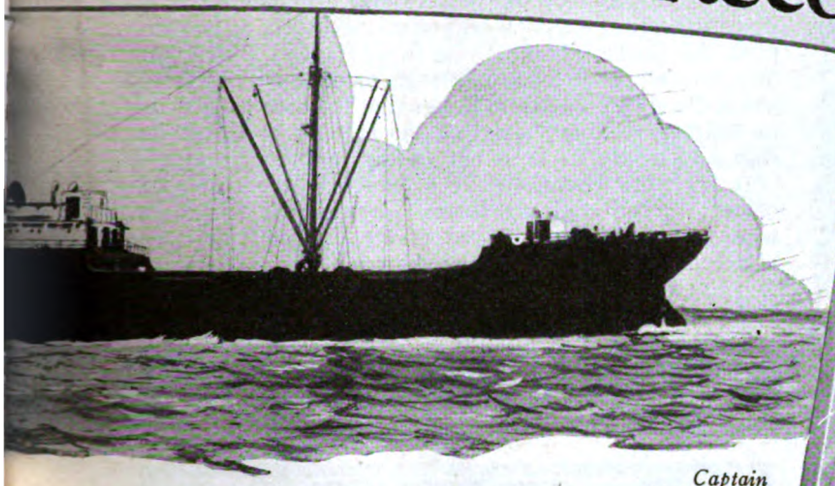
an Exceptional Record

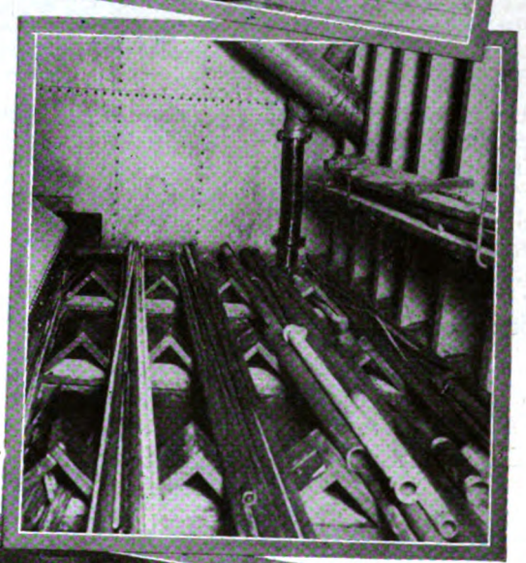


Captain M. R. Coward

The crew has installed new machinery, including two fuel oil service pumps, one bilge pump, six safety valves, one fuel oil meter, one pyrometer and a sanitary pump. The boilers are now being retubed after the eightieth voyage.

She has made 28 voyages in the time that she has been under her present management and has entered and cleared from 147 ports. Her total distance traveled in 5 years 3 months and 10 days has been 222,845 miles. For this period the total time that this ship has been stopped at sea for repairs was 5 hours and 55 minutes, of which 4 hours and 10 minutes occurred in her first voyage. Her total port detention, due to mechanical troubles, was 3 hours and 38 minutes. It is interesting to note that this was caused by an overcoat falling into the steering gear.

Her efficiency as recorded at the office of the United States Shipping Board shows her to be the best of her class out of any North Atlantic port. A few ships have better records than she, but those that have received higher ratings are blessed with a run that keeps them in southern waters a large portion of the time. At sea her efficiency has varied between 65.9 percent and 117.5 percent. Her records show a steady increase in efficiency from her first voyage after being taken out of layup to give an average sea efficiency of 99.25 percent for 25 voyages. A record of this sort is indeed enviable.



The spare bunkers now serve for storage space

It might be well at this time to explain the method by which these efficiency ratings are obtained. On page 268 curves are plotted for various drafts with nautical miles per ton of fuel oil as ordinates and speed in knots as abscissae. These curves pertain to all vessels in the same class and are based on a ship whose propeller is 16 feet 6 inches in diameter and 13 feet pitch. For instance, if a vessel of this class is traveling 10 knots with 22 feet draft, she should travel 8.45 miles on a ton of fuel oil in order to rate 100 percent in efficiency. These

Every tool or spare part has its place in this storeroom

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curves have been calculated by the Fuel Conservation Section of the United States Shipping Board Merchant Fleet Corporation and serve as a basis for standardizing the performance of all ships in this class. On many voyages, however, ships are often unable to make a good showing in efficiency due to storms and adverse weather

Table I.—Auxiliaries on the S. S. Westerner

BELOW DECK

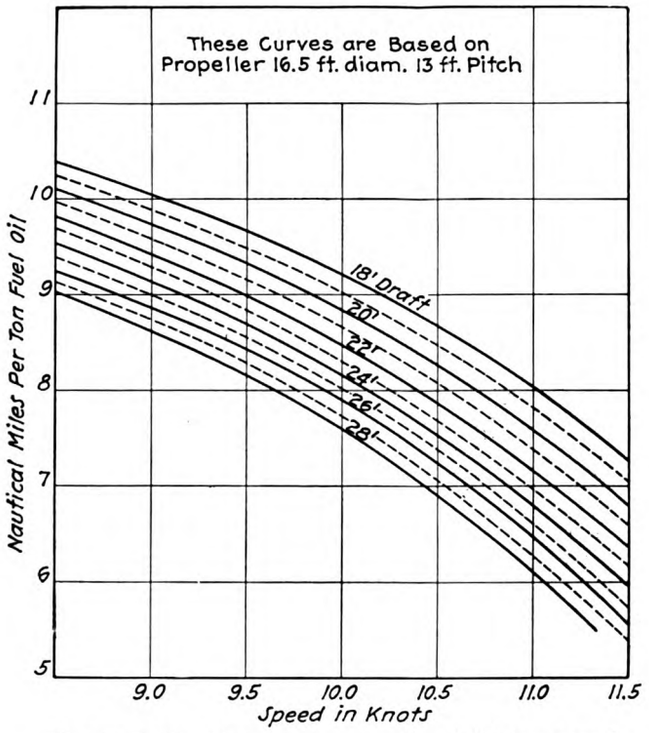
Condensers. Duthie built main and auxiliary condensers of 4,391 and 942 square feet cooling surface, respectively.
Generators. Two General Electric dynamos of 15 kilowatts each with reciprocating engines, 8 by 6 inches, vertical.
Pumps, Water. Circulating pump and engine made by the Morris Machine Works, Baldwinsville, N. Y. One ballast pump, 12 by 10 by 12 inches, duplex. One general service pump, 12 by 8½ by 12 inches, duplex. The above pumps of Platt Iron Works make. One bilge pump, 6 by 5 by 6 inches, duplex. One oil cooler pump, 7½ by 7 by 10 inches, duplex. One sanitary pump, 7½ by 5 by 6 inches, duplex. One main air pump, 14 by 23 by 28 by 16 inches, twinplex. Two feed pumps, 12 by 8 by 24 inches, simplex. All six of Worthington make.
Pumps, Oil. Two fuel oil service pumps, 6 by 4 by 6 inches, duplex. Two lubricating oil pumps, 7½ by 7 by 10 inches, duplex. The above pumps of Worthington make. One transfer pump, 10 by 8 by 10 inches, duplex, of Platt Iron Works make.
Feed Water Heaters, evaporator, two oil coolers and distiller of the Reilly multicoil type manufactured by the Griscom-Russell Company.
Ice Machine. Brunswick direct connected ammonia system with ice box capacity of 1,079 square feet.
Fuel Oil Heaters. Three Coen improved cleanable type.
Safety Valves. Six 3½ inches twin valves of Ashton Valve Company make.
Oil Purifier. One De Laval centrifugal.

DECK AUXILIARIES

Steering Gear. American Engineering Company screw type with Telemotor control, 8 by 7-inch engine.
Winches. Ten 8 by 8-inch with 12-inch drums. Willamette Iron Works.
Windlass. One 10 by 10 inches, made by American Engineering Company.

which cause an abnormal amount of slippage. Therefore in order to give a ship a fair opportunity to make a good showing that part of a voyage where the slippage is greater than 20 percent is omitted as being out of control of the crew.

Up to this point we have dealt with facts as they appeared in the records of the Shipping Board and in the ship's log but we have said little of the real reason for this performance. It has not been mentioned why this

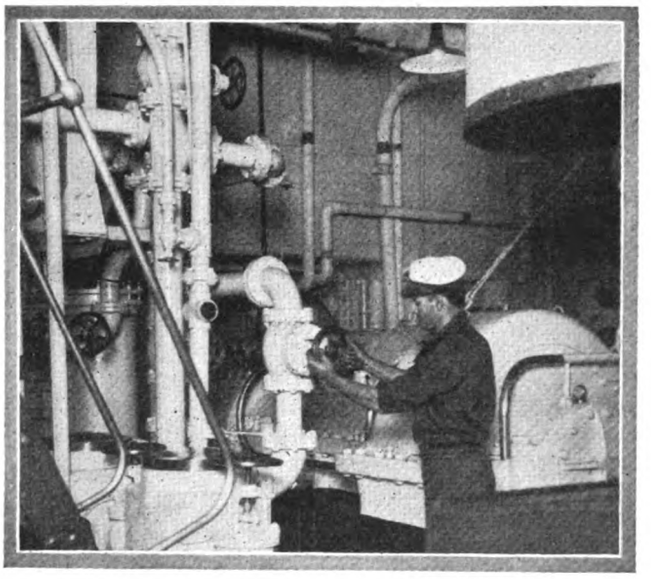


Standard of performance curves for 8,800-ton vessels

ship is in better condition today than she was 5 years ago where other ships are in constant need of repairs.

This performance is due almost entirely to the type of personnel that operates the ship. The interest that is taken in the ship by the officers and men has inspired that little added exertion and effort necessary to accomplish the results obtained. It is this added effort that may be seen in the many odd refinements here and there about the ship. The little things that the men have done in their spare time show that the crew is proud of its ship and desire to keep her in the best condition.

A very few changes have occurred in the roster of officers in the engineer force. In most of the cases where changes have occurred, officers have left the ship to accept promotion on other ships but the outstanding fact to be noticed is that Chief Engineer W. F. Woodcock has been in charge of the engine department since she has been operated by the American Diamond Lines. Offhand this may seem to be a small point but it is indeed an important one. Mr. Woodcock's continued command has enabled him to carry out a reconditioning



A corner of the engine room

program which could not easily be done in less time than it has taken. He has instilled his ideals of system in his men so that he is able to know the exact condition of all machinery and equipment at all times.

A personal inspection of the S. S. *Westerner* on March 7, while she was at dock in New York harbor substantiated the good reports that had been made. Outside hull, on deck, in quarter, in engine room and boiler room cleanliness and good order prevailed and practically no signs of deterioration were noted.

It is a pleasure to see the *Westerner*. Her appearance is trim and her decks and houses present a shipshape appearance. The engine room seems to be more like that of a yacht than a freighter. Neatness is the outstanding feature. Where hand wheels or parts were missing, those parts have been made in the ship's machine shop. Brass has taken the place of paint wherever possible so that the ship glistens with polished metal. It is interesting to note that brass covers have been placed on various pieces of machinery to beautify the mechanism. In the photograph of the engine room attention is directed to the caps on the auxiliaries in the lower left hand corner.

The spare bunker space has been made over into storerooms that would put many of our large industrial

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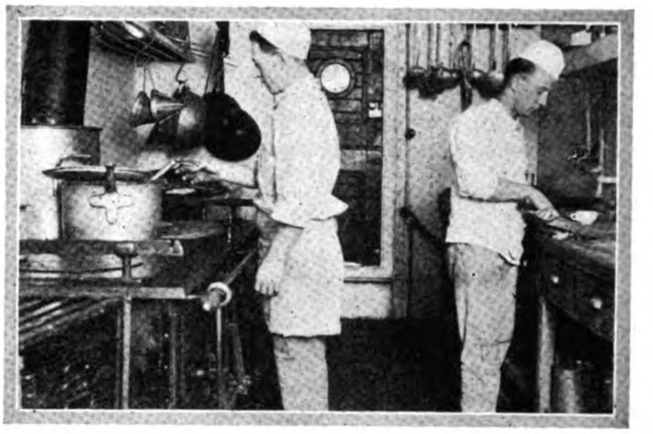
plants to shame. Racks have been built in one of the storerooms and every piece of material has been assigned to a place. Nothing is left to chance. Everything is where it is supposed to be and is easy to find. The orderliness of this storeroom is a manifestation of the systematic way in which the crew of the vessel have taken care of details.

Table II.—Particulars—S. S. Westerner

HULL	
Length overall	423 feet 9 inches
Length, waterline	410 feet 5½ inches
Beam, molded	54 feet 0 inches
Depth, molded at side to upper deck	30 feet 2½ inches
Draft	24 feet 0 inches
Deadweight, in tons at mean load draft	8,618
Gross tonnage, U. S.	5,663
Net tonnage, U. S.	3,435
Number of winches	10
Number of hatches	10
Total fresh water capacity, tons	210
Total fuel oil capacity, barrels	8,500
Speed, normal in service with average sea conditions and dirty bottom, knots	10.5
Class, American Bureau	
MACHINERY	
Main Engine. One General Electric turbine.	
Total shaft horsepower	2,500
Steam pressure at turbine inlet in pounds per square inch gage	195
Superheat, degrees Fahrenheit	64
Speed in revolutions per minute	3,300
Number of stages ahead	5
Number of stages astern	2
Gearing. General Electric type.	
Reduction in revolutions per minute from turbine to propeller shaft	3,300-450-90
Boilers. Built by the Commercial Boiler Works, Seattle, Wash.	
Type	Scotch
Number	3
Length	11 feet
Diameter	177 inches
Length of furnaces	7 feet 3 inches
Diameter of furnaces	43 inches
Number of ordinary tubes	249
Number of stay tubes	111
Heating surface per boiler	2,685 square feet
Draft	Natural
Water evaporated per pound of fuel oil	13.1 pounds
Fuel oil burners	Coen type
Superheaters	Foster type

The shaft alley on most ships is a catch-all for all sorts of nondescript material. Spare pipe and bars of tool stock, spare wire and lumber often find their way to the burial ground of the shaft alley. In most ships the chief engineer apologizes for the condition of the shaft alley but on the *Westerner* there is no need to be ashamed. Nothing is in the shaft alley that does not belong there. No spare parts, no paint cans, dirt nor rubbish is to be found in this part of the ship. All pipe and repair material is stored in orderly manner in the spare bunker space forward of the storeroom as is shown in one of the illustrations. This space is neatly painted and kept clean and is ideal for the purpose intended. Since it is located adjacent to the boiler uptakes it is too warm to be used for cargo space but it amply lends itself to the purpose for which it is now employed.



The galley that supplies good food

The engine room and all adjacent spaces are always clean and painted. No material is allowed to collect and all tools, tackle and stores of every description are returned to their proper place as soon as they have served their purpose. In the fireroom the valves have been covered as far as possible by metal enclosures with polished steel tops. These may be seen to the right in the illustration of the boiler room. The valves that usually appear above the boiler room floor have been moved below and the handwheels are accessible through holes in the floor for that purpose. These holes are covered with pieces of flooring in such a way that one is hardly aware that valves are there. With all these valves covered there appears to be more room around the boilers. Its surface being uninterrupted by ungainly mechanism, the large expanse of floor space is more

Table III.—S. S. Westerner—Summary of Voyage Records

Voyage Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Dates Out	1-5-23	3-23-23	6-1-23	7-27-23	9-30-23	12-2-23	2-13-24	4-17-24	6-30-24	8-30-24	10-30-24	1-6-25	3-18-25	5-16-25
Dates Return	2-28-23	5-3-23	7-15-23	8-9-23	11-12-23	1-15-24	4-9-24	6-19-24	8-22-24	10-21-24	12-26-24	3-5-25	5-2-25	7-4-25
Observed Miles	8205	7394	7878	7653	7634	8303	7869	8043	7856	7912	8502	8515	7726	7871
Hours in port	265	382	681	565	704	533	434	827	765	700	750	603	696	566
Total fuel used in port, bbls.	463	804	915	1072	1246	1224	665	1069	1042	1090	995	1065	1044	753
Total fuel for voyage, bbls.	10380	8330	6968	7055	6565	8743	7846	8401	7111	7000	7883	8238	7369	6587
Observed speed, knots	7.30	9.86	10.49	9.98	10.36	9.87	9.22	8.86	10.52	10.48	9.71	9.46	9.68	10.2
Wheel knots	11.23	11.90	11.83	12.08	11.72	11.54	11.8	11.82	12.13	12.10	12.05	11.95	12.05	11.9
Percent slip	35	18.12	11.47	17.43	11.8	14.31	21.7	25.0	13.00	13.5	19.5	21.0	19.7	14.2
Average R.P.M.	78.44	88.59	88.0	89.81	87.25	85.79	87.8	88.1	90.4	90.2	90.1	89.2	89.8	88.7
Fuel 24 hours at sea, bbls.	219.5	219.8	200.4	186.4	191.2	196.99	191.2	196.0	193.0	189.5	188.0	188.0	186.0	180
Fuel 24 hours in port, bbls.	37	52.4	32.1	45.6	42.6	55.6	36.8	31.2	32.75	37.4	31.8	42.4	35.0	32.0
Miles per ton of fuel	6.19	7.13	8.30	8.56	8.62	7.97	7.75	7.20	8.68	8.78	8.22	8.06	8.30	9.0
Sea efficiency, percent	65.9	75.8	94.8	92.6	92.1	92.6	97.0	88.0	108.5	105.0	115.0	95.3	89.5	117.0
Port efficiency, percent	.....	.....	.....	.....	.....	.....	81.6	.....	83.6	76.3	85.0	73.3	80.5	81.0

Voyage Number	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Dates Out	7-18-25	9-23-25	12-2-25	3-3-26	5-8-26	7-19-26	9-28-26	12-12-26	2-20-27	5-4-27	7-5-27	9-8-27	11-7-27	1-11-28
Dates Return	9-3-25	11-18-25	2-17-26	4-27-26	7-7-26	9-13-26	11-29-26	2-5-27	4-11-27	6-18-27	8-19-27	10-14-27	12-27-27	2-26-28
Observed Miles	7716	8104	9189	7893	7999	7614	7819	8213	7585	7594	7599	7555	8063	6779
Hours in port	736	796	851	688	814	844	908	607	613	922	745	643	818	353
Total fuel used in port, bbls.	768.4	870.64	1364.0	963.26	1055	1095	1493	1135	868	965	615	710	913	562
Total fuel for voyage, bbls.	6296	7934	9797	7928	6932	7272	9038	8559	7556	6769	5756	6625	8651	6479
Observed speed, knots	10.47	8.88	7.20	8.32	9.25	9.47	7.95	8.47	9.0	10.10	10.44	9.64	7.90	8.80
Wheel knots	12.05	11.85	10.2	11.88	11.72	11.80	11.53	11.55	11.25	11.45	[illegible] 60	11.16	11.40	11.43
Percent slip	13.1	25.2	29.5	30.0	21.0	19.7	31.0	26.5	20.0	11.80	10.00	13.61	30.70	22.95
Average R.P.M.	89.5	88.2	75.8	89.4	88.2	88.6	86.5	87.0	87.6	89.4	90.4	87.1	88.83	89.10
Fuel per 24 hours at sea, bbls.	188.6	184.0	156.0	176.5	165.0	179.0	182.0	185.0	183.5	185.0	177.4	173.3	166.3	176.20
Fuel per 24 hours in port, bbls.	25.04	26.3	38.5	33.6	31.0	31.2	39.36	45.0	29.2	25.1	19.30	26.55	26.78	39.70
Miles per ton of fuel	8.87	7.67	7.33	7.51	8.93	8.40	6.92	7.30	7.81	8.70	9.36	8.84	7.56	7.96
Sea efficiency, percent	115.0	108.5	99.5	0*	117.0	117.5	0*	85.0	103.2	105.5	107.6	99.3	98.3	96.2
Port efficiency, per cent	88.8	88.3	84.3	84.2	88.2	89.4	83.0	76.0	85.5	87.5	118.6	108.11	90.5	81.9

* No sea efficiency estimated for voyages 18 and 21 due to excessive slip caused by abnormal weather and draft conditions.

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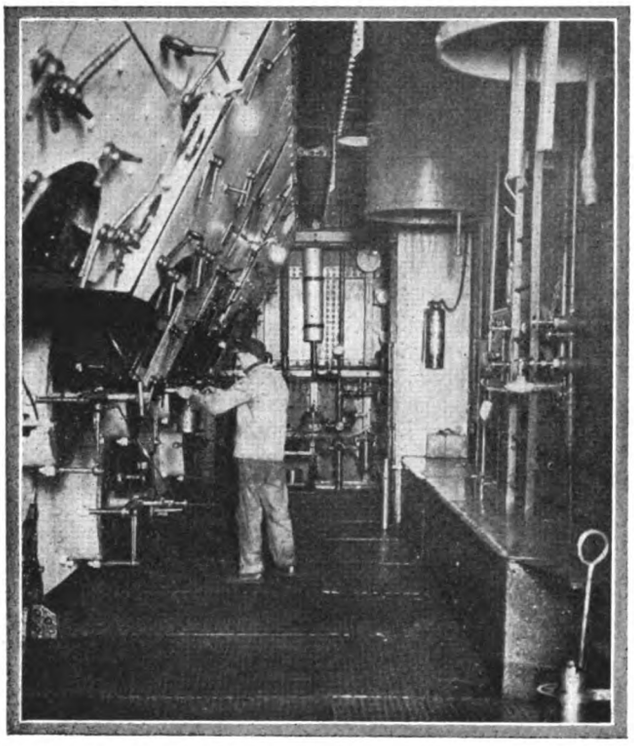
easily kept clean. The cleanliness and neatness of the fireroom should serve as a criterion upon which to pattern other ships in her class.

With all this neatness and attention to details there is little wonder at the high efficiency record of this ship. Her equipment is under almost constant inspection and a man is responsible for the condition of each piece of machinery. One man may be in charge of certain pumps in addition to his regular duties. He must keep



This fireroom should be a criterion for other ships

his particular station clean, painted, and in good running order. Every man must keep his equipment up to the standard set by the chief. In this, there is a spirit of friendly competition that prevails; for each man is trying to make his equipment appear to better advantage than that of the next man. Thus steam and water leaks are almost unknown. Maintenance costs are reduced to a minimum and every piece of equipment is kept in good condition.

The deck department is kept in a similar condition to the engine room and the youthful master, Captain M. R. Coward, has inspired the same spirit of cooperation among the deck officers as in the engine department.

An air of contentment prevails throughout the whole ship. This is due in part to the efforts of the stewards who try to give every satisfaction in their department. Good food breeds contentment and where the stomach is satisfied the heart is willing to cooperate and if you do not believe that there has been cooperation, look at the results obtained.

A complete line of main and auxiliary equipment is fitted in this ship and is noted in detail in Tables I and II. A summary of the performance of the S. S. *Westerner* is given in Table III for all the voyages whose data are available since her service with the American Diamond Lines.

The steamship *Westerner* is but one of many ships that were built during the war to serve a purpose. She is but one of the many ships that are owned today by the United States Shipping Board. Public opinion has maintained that these vessels built in a time of need are now inadequate and almost worthless but this is not true.

The *Westerner* is an example of what can be done with ships of this type. If other ships will follow the example of this ship, they will be surprised at the results that may be obtained. It has taken time and hard work but the crew of the *Westerner* have produced a ship of which they as well as the management of the Black Diamond Steamship Corporation may well be proud.

New Welding Process Test

FURTHER developments of the electronic tornado which was discovered in the research laboratories of the Lincoln Electric Company, Cleveland, Ohio, about a year ago may modify all ideas as to the ductility, strength and cost of welds made by electric arc welding. This new process, based upon an electric phenomenon, which was originally considered as of only scientific interest, has been further developed so that it may become commercially practical.

Not only are the welds produced by this new process more uniform in structure and ductility but the cost of welding may be reduced. The cost of welding ½-inch plates, including operator's time, electric current and carbon electrode, is estimated not to exceed three cents per running foot.

It is not thought that this new process will affect the manual arc process, but where equipment can be automatically welded, a reduction in cost is expected.

Heretofore metal deposited by electric arc welding has developed the same characteristics as cast steel, but tests show that the electronic tornado process will produce better physical characteristics in the weld metal than in the joined plates.

The illustrations show welds on ½-inch plate. The weld was sawed from the plate and the resultant bar

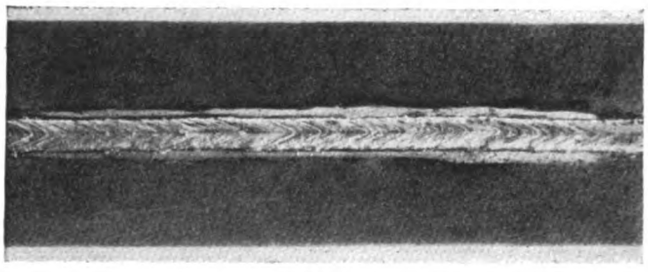


Fig. 1

Fig. 2

was twisted 1,080 degrees showing no indication of failure. In others tests, bars of weld metal were twisted cold and tied into knots; heavy plates were bent and twisted, all without sign of fracture. Tensile tests proved the welds to be satisfactory.

The new process gives a smooth finish to the weld metal due in part to the higher speed of travel of the welding heads. Microscopic examination shows that the weld metal deposited by the new process has a fine and uniform grain structure, whereas the metallic arc weld produces an irregular and coarse structure.

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European Express Cargo Liners

A 7,000 shaft horsepower Sulzer engine, the largest single acting Diesel motor yet built

By Our London Correspondent

THE shipbuilding and shipping communities throughout the world are well aware that one of the most marked influences which the introduction of the internal combustion engine has exerted is towards the construction of cargo vessels of relatively high speed. Some shipowners pretend to believe that this demand for faster transport on the part of shippers is highly unsatisfactory from the shipowner's standpoint, but, on the other hand, the fact that many owners who have built fairly fast motorships are now constructing similar vessels but of higher speed seems to indicate that such craft can be operated profitably, at any rate in certain trades.

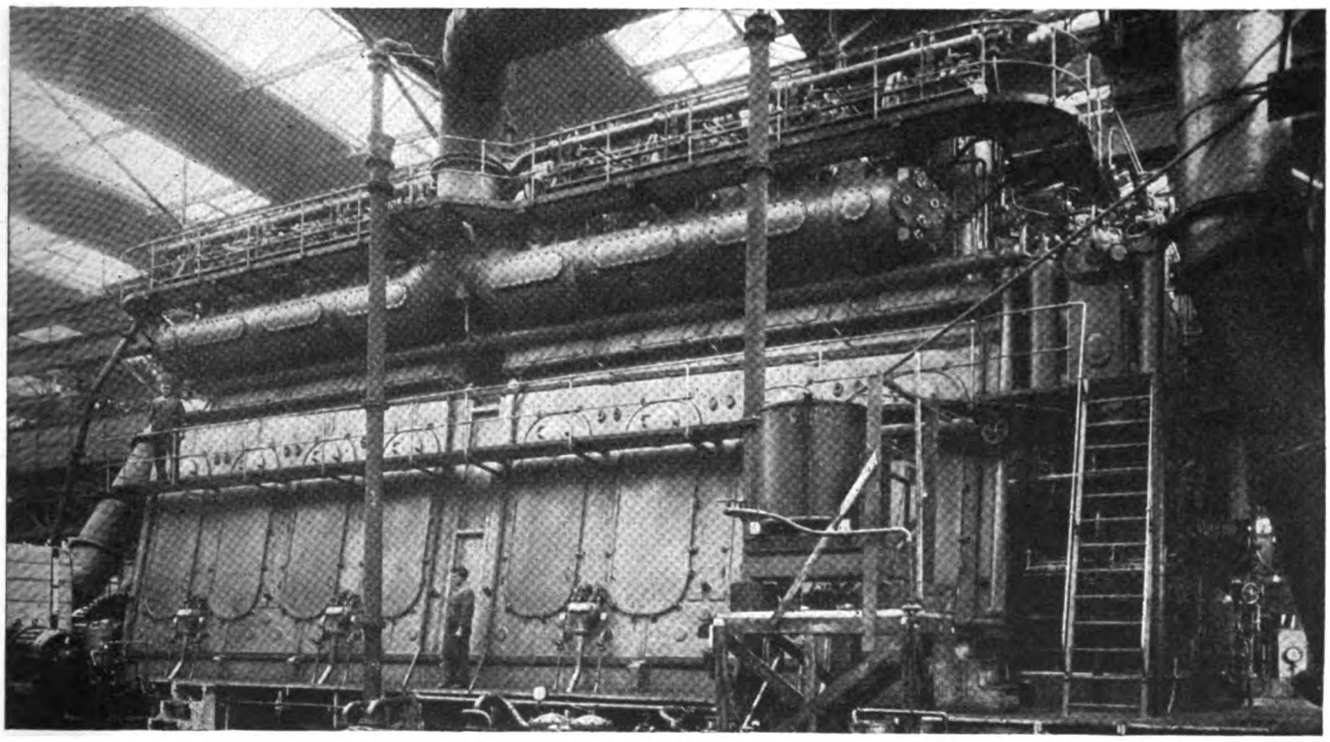
It scarcely need be explained in these days why European owners are turning towards the motorship almost exclusively when relatively high speed cargo vessels are in question. The low fuel consumption and the fact that the oil can be carried in double bottom tanks enable long voyages to be made at high speeds without detracting to any extent from the cargo carrying capacity, as would necessarily be the case were three or four times the weight of coal required for a similar radius of action in a coal burning steamer. It is, however, only fair to remark that for fast cargo ships trading across the Atlantic, there is still a good deal to be said for the geared turbine vessel with mechanical firing utilising superheated steam, and the five 14½-knot, 12,000-ton steamers of this type which have recently been built for the Canadian Pacific Railway service between England and Canada are said to have attained a coal consumption of less than 1.1 pounds per brake horsepower hour.

It is invariably found that when one firm orders fast cargo carrying ships, other owners trading along the same routes adopt a similar policy. For instance, the Shaw, Savill and Albion Company, ordered four 12,000-ton refrigerated cargo vessels of 14½ to 15 knots speed for trade to New Zealand, after the success of somewhat similar but smaller vessels of the Commonwealth and Dominion Line, also operating between London and New Zealand ports. Again, the Rotterdam Lloyd contracted for four 9,500-ton, 14½-knot ships for the Dutch East Indian service and the Netherland Steamship Company likewise ordered four vessels of larger size of equal speed. In the trade between European and Californian ports, the policy has been particularly marked, so that we now find the Hamburg Amerika Line, Furness, Withy and Company, the East Asiatic Company, the Navigazione Libera Triestina, and Fred Olsen and Company have all recently built or have under construction comparatively fast motorships for this route.

A 7,000 Horsepower Sulzer Engine

The four 14½ to 15-knot cargo ships which are building for the Netherland Steamship Company as referred to above are, in some respects, the most remarkable of their type, since they are to be equipped with the highest powered single screw machinery ever installed in a motor vessel.

They are named, respectively, the *Poelau Laut, Poelau Bras, Poelau Roebiah* and *Poelau Tello* and all are being built in Dutch yards, although the contracts for the whole of the propelling and auxiliary machinery



7,040 horsepower Sulzer marine engine, the largest of its type yet built

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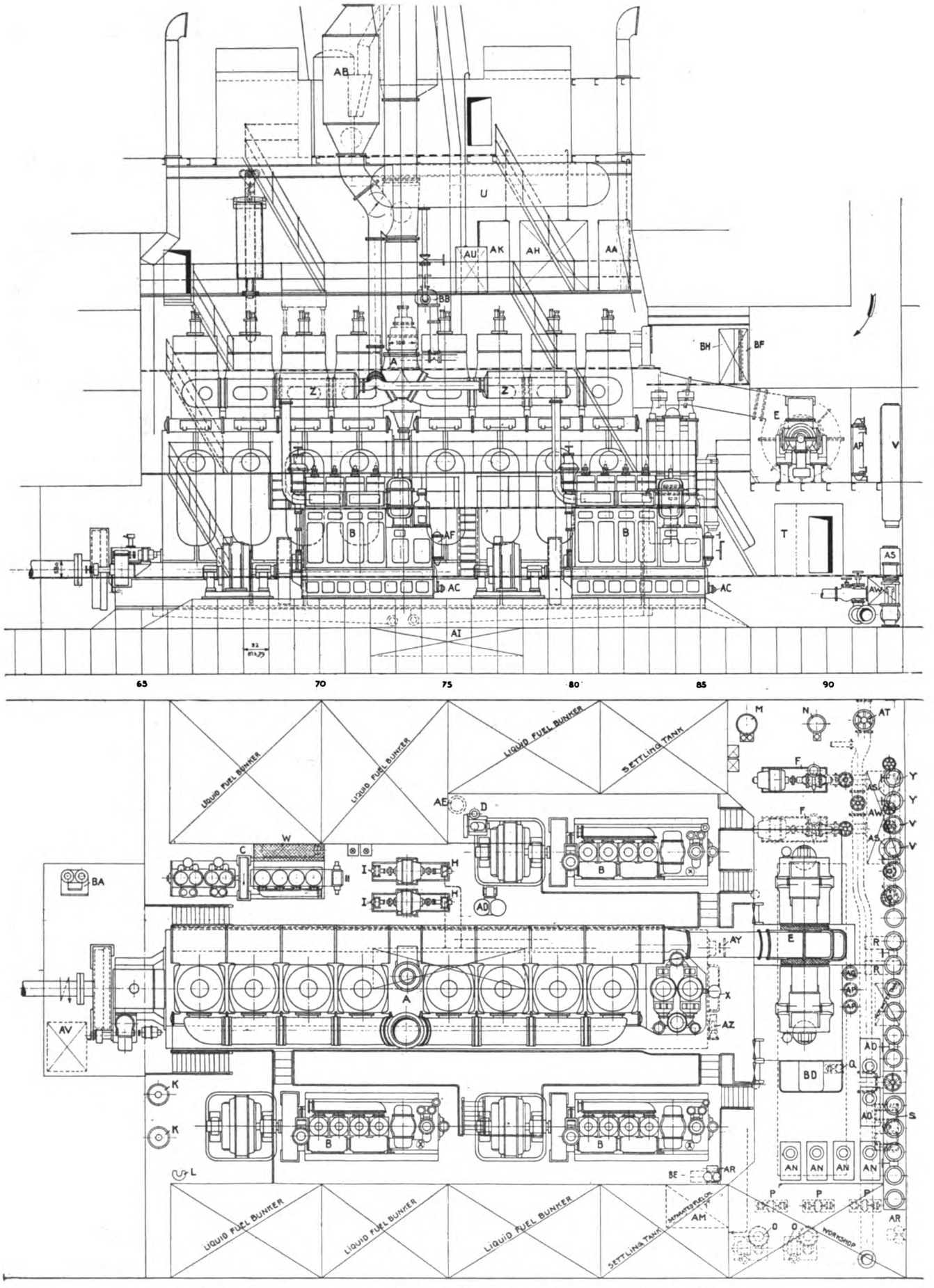

Longitudinal section and plan of the engine room of the motorship Poelau Laut

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were placed with Sulzers in Switzerland. The following are the main details:

Length between perpendiculars	490 feet
Beam	61 feet
Deadweight capacity, about	12,000 tons
Displacement	17,450 tons
Corresponding draft	28 feet
Service speed	14½ to 15 knots
Brake horsepower	7,000
Revolutions per minute	100

As is well known, the emigrant trade, of several European shipowners operating to the East, is a very important sideline in their cargo ship economics. Thus in these four vessels, arrangements will be made to carry a very large number of emigrants and this reflects on the hull design . For instance, instead of having fuel oil in double bottom tanks, these have to be reserved for fresh water and ballast water but, by the adoption of single screw propulsion, it has been possible to work in very large deep tanks in the engine room. The result is that fuel to the extent of well over 1,000 tons can be accommodated, so that in spite of the daily fuel consumption approaching 35 tons for a speed of 13½ knots, a large radius of action is thus available.

The eight cylinder propelling engine calls for special attention, in view of the fact that it is the highest powered, single acting plant operating on the Diesel principle that has yet been produced.

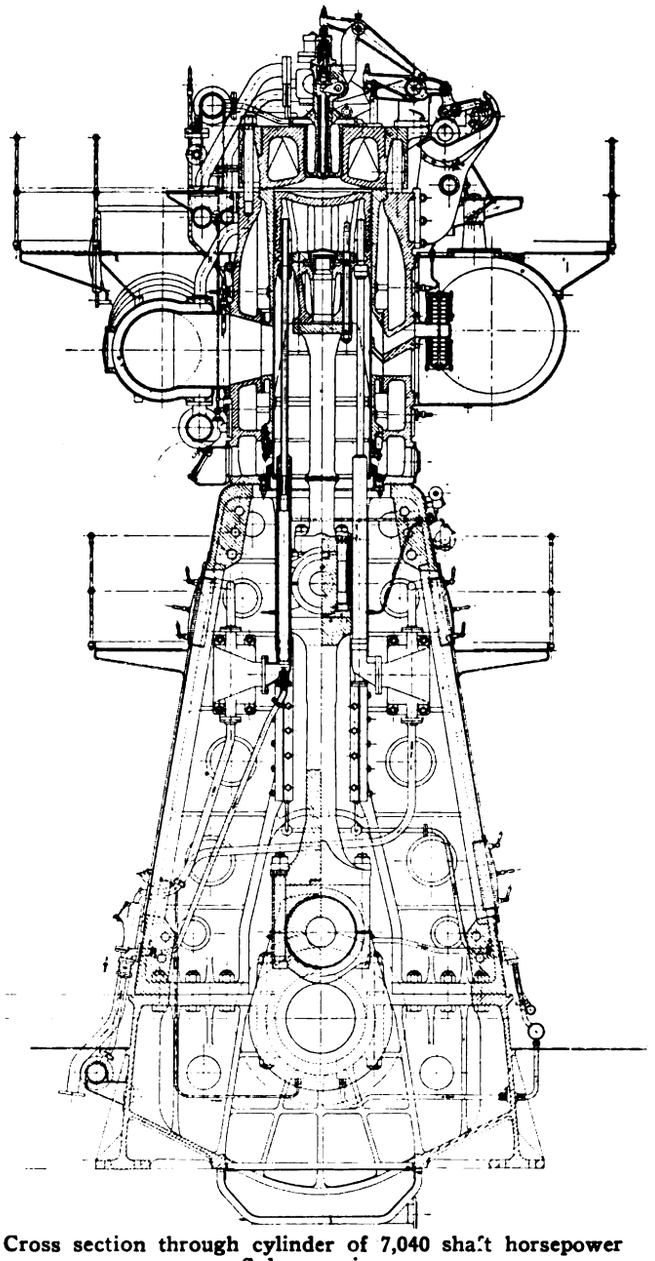
Key to Machinery in Engine Room Plans

A	Main engine
B	Auxiliary engine
C	Auxiliary engine with compressor
D	Auxiliary compressor
E	Turbo blower
F	Cooling water pumps
H	Lubricating oil pumps
I	Crosshead lubricating oil pumps
K	Bilge pumps
L	Fresh water pump
M	Ballast pump
N	Sanitary pump
O	Fuel oil transfer pumps
P	Fuel oil service pumps
O	Fuel oil circulating pumps
R	Feed pumps
S	Transformator
T	Switch board
U	Starting air tanks
V	Starting air bottles
W	Reserve starting air bottle
X	Injection air bottles
Y	Extra injection air bottle
Z	Silencers
AA	Silencer
AB	Exhaust heated boiler
AC	Lubricating oil pumps of auxiliary engines
AD	Lubricating oil strainer of main engine
AE	Lubricating oil cooler for main engine
AF	Lubricating oil cooler of auxiliary engines
AH	Lubricating oil service tank
AI	Double bottom oil tank
AK	Cylinder oil tank
AM	Tank for separated fuel oil
AN	Fuel oil separators
AO	Lubricating oil separator
AP	Fuel oil preheater
AQ	Lubricating oil preheater
AR	Fuel oil strainer
AS	Water strainers
AT	Sea water inlet valves
AU	Warm water tank
AV	Piston cooling water drain tank
AW	Water tank
AY	Maneuvering gear of main engine
AZ	Bilge pump fitted on main engine
BA	Cocos-oil pump
BB	Automatic starting air stop valve
BD	Trough for cleaning purposes for insets of separators
BF	Mess tank for cylinder oil
BH	Oil tank for auxiliary engines

It cannot be said, however, that it introduces much that is novel, for its design follows precisely along the lines of the numerous Sulzer engines that have been built but of smaller size, except for a few innovations here and there. It is stated to be conservatively rated at 7,000 shaft horsepower and, during the course of the tests, a maximum of about 8,000 brake horsepower was attained. The speed of revolution is 100 revolutions per minute and it will thus be seen that with a ten-cylinder unit 10,000 shaft horsepower could be developed at a slightly higher speed. Those who believe in the single acting engine, therefore, ask what is the need for the adoption of the double acting principle when the simple well tried single acting design can be built with complete satisfaction.

The eight cylinders are 820 millimeters in diameter, while the piston stroke is 1,440 millimeters. This gives a piston speed of 900 feet per minute, which seems quite low compared with the 1,100 feet per minute of some of the more recent double acting, four stroke engines. Moreover, the mean pressure in the cylinders is moderate, being about 72 pounds per square inch referred to brake power, and the claim is made by the builders of this engine that no matter what might happen at sea, short of breaking a crank shaft, repair can always be effected so that the vessel can reach port with the engine in service.

The engine, which is 30 feet above the center of the crank shaft in height and nearly 70 feet long, is arranged in two groups of four cylinders, with the drive from the cam shaft between the two groups. This takes the form of a spur wheel, combined with a bevel gear drive to the vertical governor shaft with helical gearing at the top driving the cam shaft. At the forward end are the two three-stage air compressors, the eight fuel pumps being driven by links from the crosshead of these two units. There is also a small horizontal bilge pump, but other auxiliaries are separately driven.



Cross section through cylinder of 7,040 shaft horsepower Sulzer engine

The control gear presents nothing unusual, except its location, which is at a point capable of actuation from the engine room floor instead of at the level of the top

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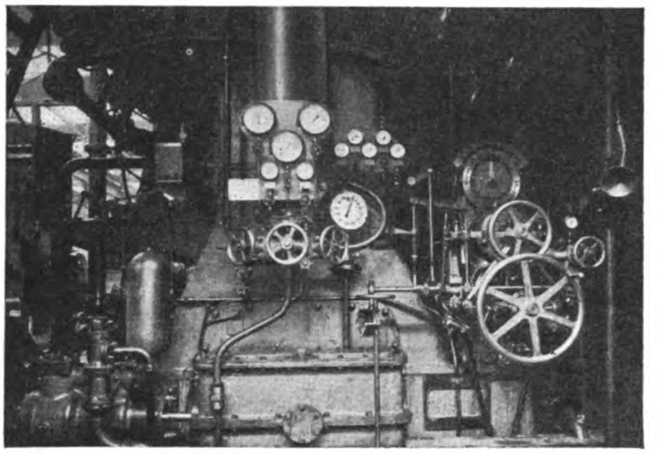
of the engine, which has been customary in most Sulzer engines built in Europe. The reversing mechanism is operated by hand but the actual starting is effected through the agency of a small lever operated servo motor.

The piston cooling gear, an important point in the design of Diesel motors, is new, the water being discharged through a fixed nozzle into a single sliding telescopic pipe attached to the piston head, the delivery taking place through an orifice at the bottom of the telescopic pipe. Sulzers still adhere to the practice of



Controls of the 7,040 horsepower Sulzer engine

utilising salt water for cooling, although some builders, such as Doxfords, hold rigidly to fresh water and Burmeister and Wain are equally firm in their conviction that lubricating oil cooling for the pistons is essential for most satisfactory running. This is one of the many points upon which Diesel engine manufacturers are at loggerheads.

The engine drives two three-stage injection air compressors in tandem, also a bilge pump, but the scavenging air is supplied in the normal Sulzer manner from a separately operated turbo blower, with three electric motors, one on each side. The capacity of this blower is 560 cubic feet of free air per second, and it runs normally at between 2,300 and 2,500 revolutions per minute, each of the electric motors having an input of about 400 kilowatts.

Electric power is used throughout the ship, and three auxiliary Diesel engines of the single acting Sulzer two cycle type are installed, each developing 360 brake horsepower and running at 180 revolutions per minute. These represent something of a new type, as they are crosshead units, and there is a lantern piece below the cylinders so that oil cannot fall down into the crank case and any sea water leaking from the piston cooling system is also drained off and prevented from mixing with the lubricating oil.

Steam is used to a certain extent for heating purposes and an exhaust heated boiler is installed, receiving the gases from the propelling engine. This is somewhat unusual since it is not often considered worth while to pass the exhaust gases from two stroke machinery through boilers. There is, in addition, a small oil-fired boiler.

12,000-Ton Shaw, Savill Cargo Liners

The *Zealandic*, which has just been completed, and the three sister ships building for the Shaw, Savill and Albion Line for regular service between London and New Zealand ports, show a remarkable similarity in size, power and speed to the four vessels just described. The dimensions of the *Zealandic* are as follows:

Length between perpendiculars	481 feet
Beam	64 feet
Brake horsepower	7,450
Sea speed	14½ knots

These vessels are, however, different in that they are equipped with twin screw machinery. The *Zealandic* has two 3,725 brake horsepower engines of the Sulzer type built in England under license and they run at 115 revolutions per minute, having six cylinders, 31 inches in diameter and a piston stroke of 43 inches. From an examination of the two ships, there does not appear to be much difference in the length of the engine room in the two cases, and in the *Zealandic*, as in the ships just described, oil fuel is carried in deep tanks around the engine room. The *Zealandic* has a refrigerating space of about 400,000 cubic feet and the refrigerating machinery is all electrically operated, owners having now apparently come to the conclusion that no risk is involved in adopting this system. The cargo is handled by 20 electric winches, and there are six holds, three forward and three aft of the motor space. In this ship, only 8 passengers are carried.

Rotterdam Lloyd Cargo Ships

The four new Rotterdam Lloyd cargo ships also for the Dutch East Indies service are considerably smaller, being 467 feet overall, with a beam of 60 feet 6 inches, their deadweight capacity being 9,300 tons. Of the four ships, two are completed and one pair has Sulzer machinery, the other being fitted with double acting, two stroke M. A. N. motors. They are all single screw craft and the power of the engines is in the neighborhood of 5,000 shaft horsepower to give a speed at sea when fully laden of 14½ knots. Actually, in service, 15 knots has been maintained for a considerable period. The consumption is about 20 tons daily for all purposes.

Diesel-Electric Tugs Trinidad and Chagres

By Lieutenant W. McL. Hague, C.C., U.S.N.

THE Diesel-electric tugs *Trinidad* and *Chagres* were built for the Panama Canal by the Mechanical Division of the Canal. They were launched in May 1927 and completed in January 1928, the *Chagres* being turned over to the dredging division and the *Trinidad* to the marine division of the Panama Canal.

Diesel-electric tug Chagres

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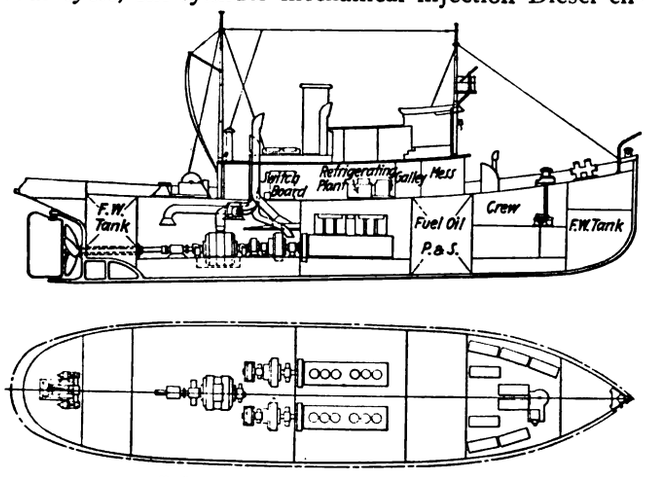
Except for slight differences in equipment and arrangement the tugs are exactly alike. The following are their hull particulars:

Length overall	126 feet 5 inches
Length between perpendiculars	112 feet
Breadth molded	28 feet
Depth molded	15 feet 7 inches
Mean draft	13 feet 0-½ inch
Displacement loaded	623 tons

Primary power is derived from two Ingersoll-Rand four-cycle, six-cylinder mechanical injection Diesel engines of 480 horsepower normal output at 257 revolutions per minute. The engines are direct connected each to a 330-kilowatt 250-volt generator and a 50-kilowatt 250-volt exciter. The main driving motor is of the double unit type mounted on the single propeller shaft and has a normal rating of 750 shaft horsepower but is capable of delivering continuously on overload 900 shaft horsepower at 1,220 to 1,450 amperes and 500-volts. The operating speed range of the main motor and propeller at full power is 115 to 150 revolutions per minute. The main propelling electrical machinery was supplied by the General Electric Company.



Inboard profile and hold plan

Control

The main generators being directly connected to the Diesel engines are always turned at approximately 257 revolutions per minute and on propulsion are in series with the two units of the driving motors. Speed variation is by the Ward-Leonard system of control. There are three control stations: the main switchboard in the machinery spaces, an after control station on the deck house and a control station in the pilot house. The pilot house and after station control is effected through standard Cory indicator pedestals operating a rheostat mounted under the pilot house false deck, the Cory indicators being mechanically connected. There is one pedestal at the after control station and one on each side of the pilot house. These pedestals are of the single handle type, the stop position being in the middle of the arc, full speed ahead position, 90 degrees forward and a full speed astern position 90 degrees aft. There are 25 speeds ahead and 25 speeds astern.

The steering gear is of the electro-hydraulic type built by the American Engineering Company, the 7½-kilowatt motors having been furnished by the General Electric Company. The steering gear is duplicated throughout. By making the stern frame a skeleton casting, as can be seen on the inboard profile, the turning circle of these tugs has been made very small, not exceeding 500 feet.

The two fuel oil tanks have a capacity of 108 tons, which gives a range of approximately 25 days at sea and a cruising radius of approximately 7,000 miles under full power. The lubricating oil capacity is 450 gallons. A De Laval oil purifier is installed in the engine room and it is believed that the lubricating oil carried will outlast the fuel.

Fire Fighting Equipment

The tugs can be used for fire fighting, as they are equipped with a 1,000 gallon per minute Frederick Iron & Steel Company centrifugal pump driven by a 100 to 115 horsepower General Electric motor. A fire monitor is mounted on top of the pilot house on the *Chagres* and on a platform forward of the foremast on the *Trinidad* and in addition there are two hose connections mounted on each side of the deck houses.

There are two 250 gallons per minute rotary bilge and circulating pumps either of which is capable of circulating both main engines. The sanitary pump is a 50 gallons per minute Frederick Iron & Steel Company centrifugal pump and is capable of furnishing emergency circulation to the main engines. Other auxiliary pumps include a fuel oil transfer pump and a fresh water transfer pump. The fresh water carrying capacity of each tug is 85 tons.

Each boat is provided with a Cummings Diesel auxiliary engine direct connected to a 12-kilowatt 220-volt generator and clutch connected to a two-stage 250-pound Ingersoll-Rand air compressor. This air compressor is used only for pumping up three 5-cubic foot air bottles for starting and galley air, the pressure of these bottles being normally maintained when the main engines are running, by an automatic General Electric-Ingersoll-Rand combination motor driven two-stage air compressor.

Each tug is equipped with a combination capstan and anchor winch built by the American Engineering Company, motor driven by a General Electric reversible series motor, capable of heaving in a 1000-pound anchor in 30 fathoms of water at 30 feet per minute.

Suitable cold storage spaces are provided and refrigeration is obtained from an Audiffren refrigerating machine.

Service

The *Trinidad*, which is used as a combination harbor and sea tug by the marine division, having charge of handling ships through the Canal, will occasionally be called upon to make long trips at sea to service or tow disabled vessels. Because of this she is equipped with a 500-watt radio with a range of 1,000 miles at night. She is equipped with an electrical towing machine built by the Markey Machine Company of Seattle.

The *Chagres*, while available for emergency sea trips, is used primarily for towing barges from the dredges to the dumping grounds and in servicing the dredging equipment of the Canal. She is equipped with an Allan-Cunningham full automatic towing machine with an in-haul capacity of 75 feet per minute at 25,000 pounds.

Ventilation

The tugs were built for operation in Canal Zone waters where the average air temperature is 88 degrees F. Under these conditions ventilation of the electrical machinery room was a primary problem. The problem was rendered more difficult by the necessity of completely covering the main generators and exciters to guard against the sudden heavy rain squalls of the Canal Zone having access to the electrical machinery. The problem was met by mounting a 6,000 cubic feet Sturtevant-General Electric blower whose suction was taken from between the two halves of the main propell-

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ing motor and carrying the discharge up the center line to a breeching, the two outboard legs of which were connected to the hoods of the generators and exciters. This arrangement will be made clear by reference to the inboard profile.

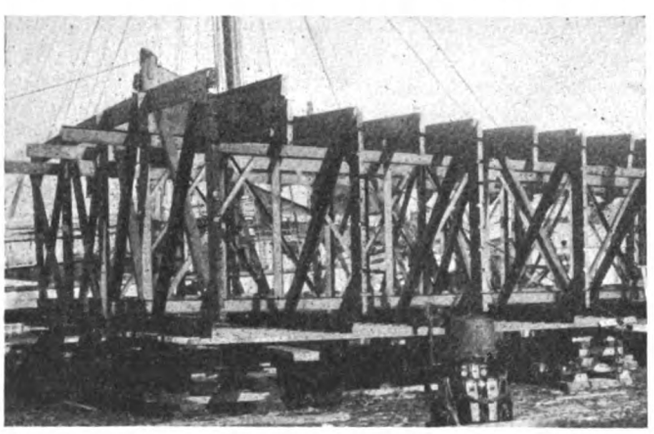
In this way the main motors, which operate at low variable speeds, are given the primary ventilation and the generators and exciters, which are operating at a relatively high constant speed, were given natural stack ventilation augmented by the jet action of the blower discharge. Natural cowl ventilation for fresh air was provided at three points, aft of the main motors and outboard on each side of the main generators, care being exercised in the design of these systems to preclude the possibility of rain being sprayed on the electrical equipment.

Each tug was given a rigorous acceptance test consisting of an eight-hour dock test at 750 shaft horsepower and 100 percent slip and a sea test of six hours running at 750 shaft horsepower followed by a run at 900 horsepower until all temperatures had equalized. The propelling machinery passed these tests easily.

Cabin quarters are provided on each tug for a captain, two mates, a chief engineer and two assistants. The crew's quarters accommodate twenty-four men.

A Fabricated Steel Barge

THE practicability of fabricating steel barges and erecting them at some distance from the home plant was recently demonstrated by the Midland Barge Company, Midland, Pa., a subsidiary of the Treadwell Company, New York. In executing an order placed by the New York & Hastings Steamboat Company, New York, for a barge to be built on the Ellis Channel system of construction, the Midland Barge Company fabricated all steel material at its plant, assembled and riveted the structural parts into large sections and shipped them by



Erecting the barge

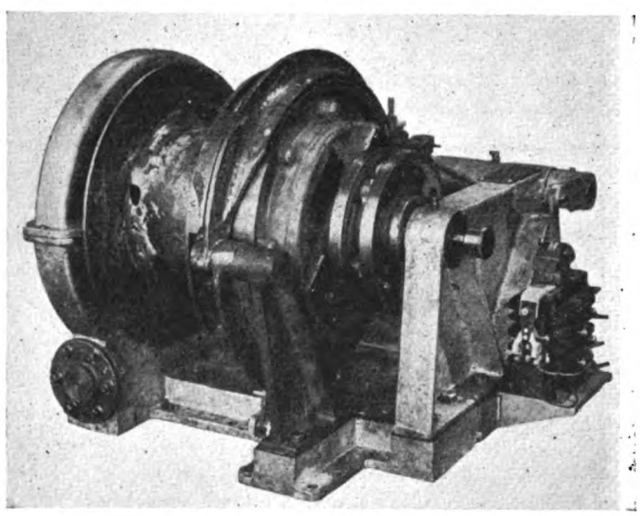
rail to the Smith and Williams Company, Salisbury, Md.

At this point, all transverse framing for the barge which measures 115 feet in length, 34 feet breadth and 10 feet depth was erected in a single day. The wooden deck and cabin work were done by the Smith and Williams plant and the barge was placed in service in record time from the beginning of the assembly. The barge has a capacity of 900 tons and will be used for carrying pig copper and lead from Hastings-on-Hudson, N. Y., to Perth Amboy, N. J., for the Anaconda Copper Mining Company, of which the steamboat company is a subsidiary.

Windlass Drive Utilizes Magnetic Clutches

THE American Engineering Company, Philadelphia, Pa., has developed a small windlass suitable for use on yachts and other similar vessels which employs a magnetic clutch to engage and disengage the load handled by the windlass drum. This new type windlass is known as an automatic single drum anchor windlass and the clutch employed is a modified form of the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., magnetic clutch.

The windlass is designed to handle a 150-pound anchor on a ½-inch wire cable and is suitable for use in depths up to 200 feet. The series wound driving motor, rated at ½ horsepower, operates on either 110 or 230



American Engineering Company windlass fitted with Cutler-Hammer magnetic clutch

volts direct current at 1,500 revolutions per minute normal speed. This motor drives the drum shaft through a spur and worm gear running in oil. The drum operates freely on the shaft and the outboard hub connects the spring plate of the clutch on the drum hub.

The clutch as designed incorporates two members known as a field and armature section. In the former is placed a magnetic winding so arranged that when electric current is passed through this winding, the magnetic force engages the armature member of the clutch through the action of a spring plate which supports the armature member and is secured to the drum flange. When the windlass is inoperative, the two clutch members while concentrically located have a slight clearance and run freely. When the circuit is completed, the engagement of the armature member to the field member of the clutch causes the windlass drum to revolve. The clutch is so proportioned that no shock is involved when the two members of the clutch are engaged, the action being smooth and uniform.

Control of the magnetic clutch is included in the push button control station for the contactor panel which operates the motor. At the moment the motor is operated, the clutch circuit is also engaged. A stop or release button, when momentarily depressed, disengages the clutch and allows the drum to run freely, thus permitting dropping the anchor, the speed in lowering being manually controlled. A solenoid actuated band brake functions to set the brake to hold the drum and the load upon failure of current.

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The Speed of Sea Transport

If sea speed can be boosted up what other factors will be affected?

By A. C. Hardy*

THE proposals, to which so much attention has been devoted during the past few months, for a 4-day fleet of ships which shall alter the character of transatlantic travel, are distinctly of interest at a time when the whole science of marine propulsion is undergoing a change. While these proposals have caused many experienced shipping men to shake their heads no one surely can deny the spectacular nature of the plan and an acquaintance with American shipping conditions leads one in the end to the thought that it is only a proposal of spectacular nature which can ever hope to arouse any practical enthusiasm among the American people towards a mercantile marine.

Mauretania Still the Fastest Liner

The proposal in itself serves as a reminder that no great or noteworthy increase in sea or service speed of ships has been made for several years. The *Mauretania* of 1907 was the fastest mercantile ship in the world. Today, after 20 years of hard work, she still holds that position and there seems to be no danger of her losing that title in the immediate future. Or if she does so, the ship which takes the title will not do so by more than a knot or so. Neither will this record be held by more than a very few ships. The new American proposal, if successful, will at one fell swoop push up the transatlantic speed some 5, 6 or 7 knots and at the speed at which these new monsters are to operate, just try to visualize this in terms of resistance and power required!

It would seem almost an attempt to apply railroading to the high seas, and railroading is a question upon which America knows easily more than all the other nations in the world put together. She has to. It is true, of course, in railroading that no tremendous increase in speed has taken place in the last 20 years or so. There is a maximum speed—between 60 and 70 miles per hour—at which our "Cornish Riviera's" or our "Twentieth Centuries" can travel, but such limitations are limitations dictated as much from safety considerations as from anything else—from economy of transportation for example. Similarly, there is a maximum speed for freight transportation on railroads dictated largely by reasons of economy. This speed is much lower, naturally, than that for passenger transportation. Economic conditions similarly limit the speed for freight transportation on sea, but no such considerations of safety limit the speed for passenger transportation. Economic conditions are a considerable factor in this case, as any one who has tried to operate a fleet of ships one knot faster will readily agree.

To suggest, with a critical viewpoint, that there has been no noticeable increase in service speed during the last 20 years is to do a grave injustice to marine engineering. But the cold fact remains that the average transatlantic passage today still occupies 8, 9 or 10 days, with a good cabin class ship or a slow first class ship, whereas the *Unicorn* of 1840 made the trip from Liverpool to Boston in but 14 days 8 hours, and the *Etruria* of the 'eighties made a record west bound trip from Queenstown to New York in 5 days 20 hours 55 minutes, and a record east bound trip of 6 days 37 minutes. No ships today, with the exception of the big "flyers," make this time. The average ship still goes lagging across those wide, almost limitless, spaces of ocean—cold and uninteresting—at the same leisurely gait as her predecessors of the early days of the steamship era. Nor can it be claimed that the motorship era, immature though it yet is, seems to be showing any special signs of quickening up speed beyond a few knots in the case of certain freighters.

Propelling Machinery More Efficient

Do we insinuate, then, that marine engineering has been standing still? There is not the smallest reason to support such a theory. In what direction, then, has development and improvement taken place? The one answer to this is—the whole trend of development of recent years has been towards the improvement of the efficiency of the marine propelling plants with the one object of reducing the pounds of fuel per horsepower hour figure. That, in the last analysis and assuming average freight market conditions, is the factor which makes the shipowner's money for him more than any other of the myriad interrelated conditions which constitute present day shipping economics.

In passenger ships, improvement has gone rather in the nature of interior fittings than of any particular increase in service speed. The present day passenger carrier employs the services of the interior decorator to an increasing extent and her owners, once satisfied that requirements of strength and stability have been fulfilled, give the decorator *carte blanche* to go ahead and reproduce within the hull an atmosphere of the cosmopolitan hotel.

The hull form of the big passenger liner of today is very much the same as that of the ship of 20 years ago and, aside from the difference in luxury standards, the major improvements effected have been cheapness of operation due to the substitution of oil for coal as a fuel. In figures this improvement has resulted in a reduction, for intermediate type passenger liners, of from 2.375 pounds of coal per horsepower hour in 1880 to 0.875 pound of oil per horsepower hour with the best conditions of watertube boilers and turbines in 1924, and to the low figure of between 0.4 and 0.6 pound of Diesel oil per horsepower hour for motorships at the present time. It is this tremendous economy which has driven shipowners engaged in transocean voyages to drop their coal burning tonnage in favor of oil burning tonnage and finally in favor of the Diesel engine. That the Diesel-engined ship today is usurping the steamer's position and that there are now more motorships than steamships under construction in the shipyards of the world is mainly due to this fact. That fuel oil costs more than coal, that Diesel oil costs more than fuel oil, that the Diesel engine costs more than any steam plant in existence, just as the best type turbine costs more than the old "up-and-

* Author of "Merchant Ship Types," "Seaways and Sea Trade," etc.

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downer" makes not one particle of difference. In the last analysis, the cost per ton mile for the Diesel is well under half of that for the steam engine.

Speed of Cargo Ships Increased

As a matter of fact, while in general there has been very little increase in transatlantic speed for the last 20 years or so, there is a tendency towards an increase in cargo ship speed. This is a result partly of the tremendous competition engendered by the large amalgamations of shipping companies and partly by reason of the fact that the motorship, using as it does about one-quarter of the fuel that the steamer uses and carrying, moreover, this fuel in places which cannot be occupied by cargo, can carry fuel for much longer sea passages and for faster sea passages. If, for example, a coal burning steamer of 10,000 tons capacity wants to carry fuel for sufficient power for 15 to 16 knots, she will either have to suffer a considerable reduction in cargo space or a considerable increase, with corresponding increase in cost, of hull dimensions. Also with the coal burning ship the consumption for the extra power necessary for the extra speed will increase the cost of operation. The motorship, with its low fuel consumption, can carry the fuel for the extra power necessary for the difference between 10 to 11 knots and 15 to 16 knots quite easily.

It would not seem that there will be any tremendous increase in service speed for the general run of freight ships in the next few years. At times various formulae have been devised which attempt to assess the most economical speed of transportation for certain commodities on certain routes. Economic conditions—such as competition—however, are liable to upset these. In another 25 years, possibly the airplane may have something to say in this direction. One can see signs of the dawn of an air age the world over today. If and when an air age comes, it will carry freight, and particularly bulk freight, last of all.

Dawn of the Air Age

Sir Alfred Yarrow has recently indicated that worry on the score of a big step-up in transatlantic speed is vain because in a comparatively short time aircraft will render even the ships of today a thing of the past. If and when the air age comes it will first capture the traffic at present held by the fast cross channel ship and the fast transatlantic passenger and mail liner. This will naturally be a slow process if development proceeds along the lines of cross channel air service development. This is not meant in any way to indicate that the necessary enthusiasm has not been put behind aviation projects but that the traveling public necessarily takes very slowly to anything new in transportation—a change in medium of transportation as well as a speeding up about 4 times.

All this serves once more to draw attention to the importance of the American 4-day ship proposal—in effect a 33 percent speeding up of transportation. It is interesting and important further to consider that the Atlantic and in particular the North Atlantic is the one seaway of the world in which speed is of paramount importance, because there is always a large percentage of people to whom speed of transit in either way is a matter of value. This percentage although numerically important is small compared with the big bulk of transatlantic travelers of the tourist category. On a big fast liner today one pays more in first class than on a more moderate vessel. Incidentally on the latter one eats less exotic food, tips less and one's health and pocket are happier in consequence. The extra price for the fastest ships is taken by the steamship company to pay principally for the extra speed and partly for the luxurious appointments. The scale varies, of course, with different ships and routes. Italy today holds the palm for magnificence of decoration. The extra money that one pays really amounts, in railroad parlance, to the extra fare or supplement for the exclusiveness of a fast Pullman train in Europe or for the limited train in America, where by the way, the railroad company refunds a proportion of the extra fare if the train is late in proportion to the extent of the lateness.

Rail and Ocean Transportation

It is an ever-tempting pitfall, constantly open to the student of transportation, to attempt to form railroad-seagoing analogies. Sometimes the analogies can be made very plausible but generally it will be found that sea transportation and land transportation are separate affairs. In many ways it would be of advantage to the shipping man if he could apply railroad principles of operation to his own job. The flexibility of capacity which the railroad possesses is always a feature which appeals to the shipping man who has occasionally to take a sailing with a ship of 6,000 tons capacity carrying but 4,000 tons. The railroad man can adjust the length and capacity of his carrier exactly to suit the freight or passengers available. But, alas! the *Mauretania* which pulls out of Southampton's Ocean Dock in the height of the tourist season and the *Mauretania* which leaves in the slack season must be always exactly the same size and, within limits, must use the same amount of fuel. The only flexibility of capacity the shipping man can secure is by making his ship follow the track and by creating trade. This, of course, is the essence of the tourist industry today.

The railroad is perhaps the most capacity-flexible of all instruments of transport because a "train" is essentially a mobile link-up of a whole number of transportation units adjusted minutely according to the cargo or passengers available. To be 100 percent capacity-flexible our *Mauretania* would require to be composed of a powerful tug and a string of barges—freight carriers, passenger carriers and restaurant barges—obviously an impossibility. The nearest approach to railroad operation ever approached on water is of course on the big inland waterways of the world and particularly on the European inland waterways.

So that when anyone suggests a big boost up in speed such as is visualized by the supporters of this new transatlantic greyhound scheme, one senses something of the railroad mind behind it all and one wonders whether all the many problems and factors entering in have been completely and thoroughly digested. In considering a speeding up of transatlantic travel it is constructive to remember that much could be done with existing type ships by moving the American passenger terminal from New York to Montauk Point at the seaward end of Long Island and then transporting the passengers by rail to New York and their various destinations. Use of this place as a terminal should clip at least 12 hours off the time. In thinking of transatlantic speeds, too, let us remember that even today railroad transportation from New York to San Francisco takes practically as long as the fastest ship travel from Southampton to New York, or rather from Cherbourg to Ambrose Channel. Modern transportation is an intensely complicated affair and so interconnected are its various phases that to assess definite formulae or to assert rigid dogmas is a difficult task.

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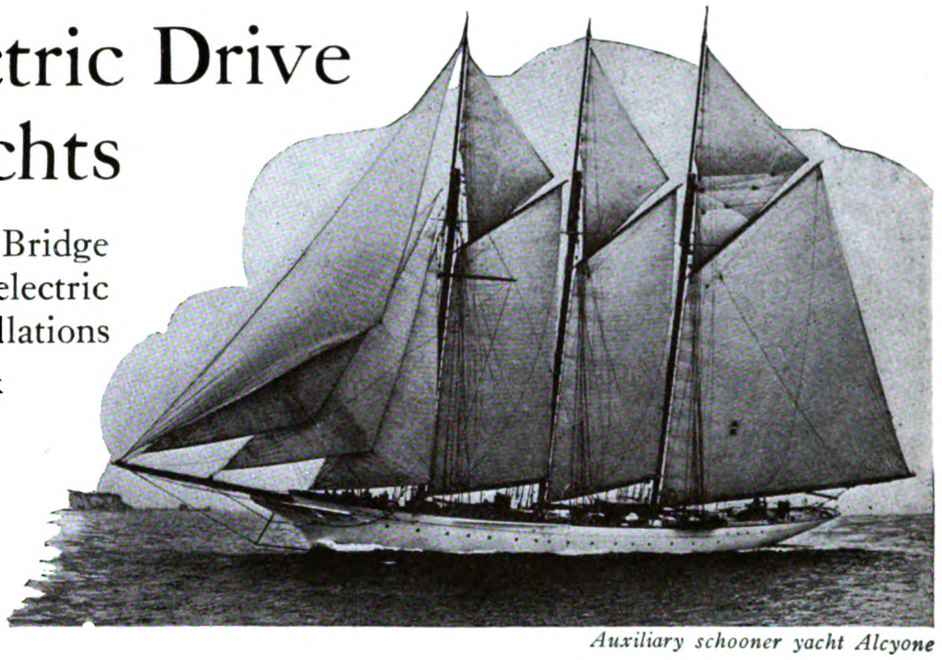
Diesel Electric Drive for Yachts

Type of equipment — Bridge control—Advantages of electric drive — Notable installations

By Robert W. Clark



Auxiliary schooner yacht Alcyone

ALTHOUGH the electric propulsion of ships dates back nearly 40 years, it was not until 1920 that the first Diesel electric drive was installed. Today the total number of marine installations of this type in the world has grown to 80, of which 77 are in the United States.

The application of the Diesel engine to marine purposes made great progress during the World War, particularly in submarine installations for which a combination of Diesel and electric propulsion was primarily designed. After the war, Diesel electric propulsion was developed in a broader sense and the first completed installation was the schooner yacht *Elfay* which was electrically equipped by the Westinghouse Electric and Manufacturing Company.

Since that installation, this type of drive has come into high favor in the marine field and the list of Diesel electric vessels now includes, in addition to yachts, cargo vessels, tankers, dredges, tugs, river towboats and ferries.

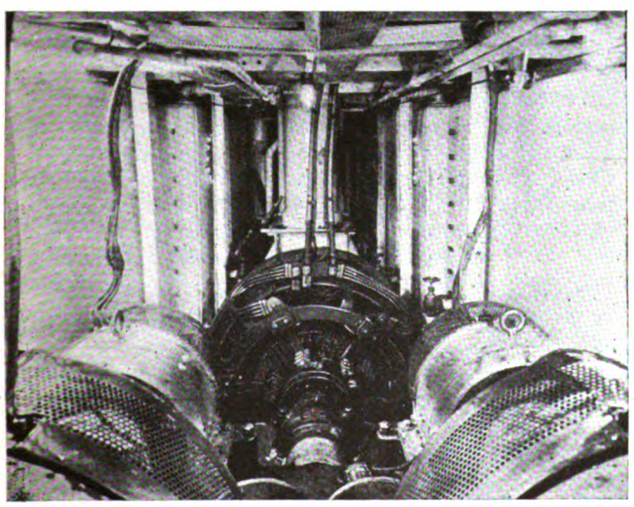
The Equipment

The principle of Diesel electric drive is so well known that it scarcely needs explanation. The generating unit consists of a Diesel engine directly connected to an electric generator. One or more of these units supply power to a propulsion motor which is directly connected to the propeller shaft. In the case of vessels having more than one screw, a propulsion motor is connected to each.

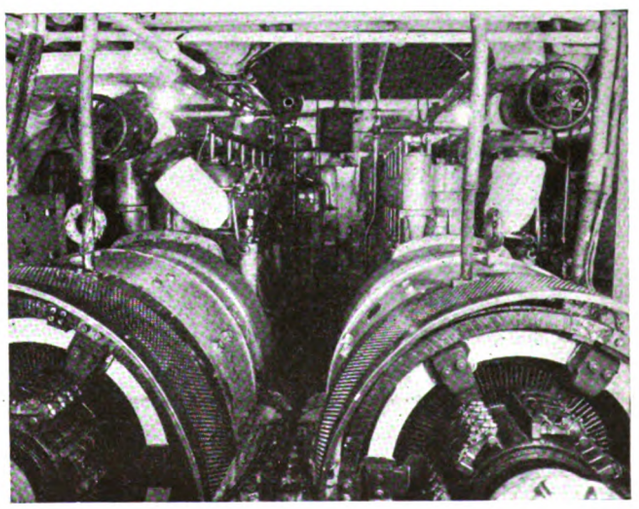
In addition to the main generators and motors, a smaller generator is necessary, which is also directly connected, as a rule, to the Diesel engine. This generator is known as the exciter, and its function is to furnish electric current to the field coils of the main generator and propulsion motor. Although the exciter furnishes constant voltage to the motor field, the electric current to the generator field is first led through a reversing rheostat by means of which the direction and intensity of the excitation is controlled, thereby regulating the speed and direction of rotation of the propulsion motor.

Vessel Controlled from the Bridge

In most installations, the exciter also furnishes auxiliary power when the vessel is under way, thus eliminat-



Engine room of the Cutty Sark, looking aft, showing main propelling motor



Engine room of the Cutty Sark, looking forward, showing main generating units

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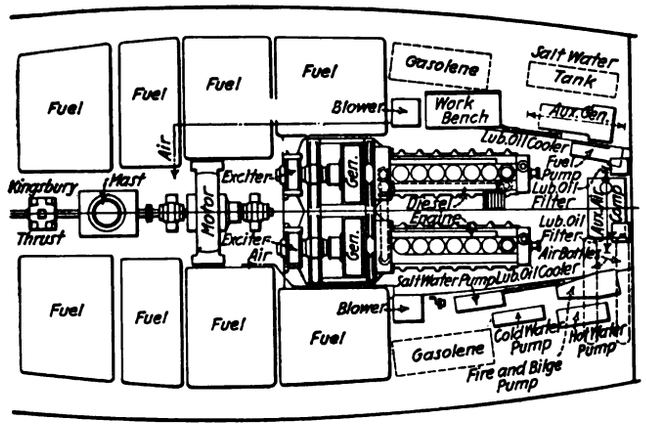
ing the operation of an auxiliary generating unit while cruising. The number of exciters depends upon the number of generating units as well as the auxiliary load they are required to carry.

This method of speed regulation makes it possible to control the vessel from the bridge or deck, as the reversing rheostat, carrying the comparatively small field current, can be located wherever desirable.

Such control is particularly advantageous to yachts or other craft operating a large part of the time in congested waters, due to the fact that it practically permits the same ease of maneuvering as a small motorboat or automobile. It also allows a reduction in the engine room crew, thereby cutting operating expenses and permitting smaller crew's quarters.

Advantages of Diesel Electric Drive

The most important advantage, however, of Diesel electric propulsion for yachts over any other type of drive is probably its adaptability of machinery arrangement to restricted engine room spaces. As a Diesel electric installation consists of several small units, and as no mechanical connection is necessary between the generator units and the propulsion motor, the various



Plan of the Cutty Sark's engine room, showing the compact arrangement of generators and propelling motor

pieces of equipment can be distributed advantageously with a resultant increase in space for living quarters. This flexibility of machinery arrangement also permits a better distribution of weight, giving greater stability through a lower center of gravity.

The absence of dirt, cinders and soot, incidental to steam driven vessels burning coal or oil, is another advantage of Diesel electric drive which appeals strongly to yachtsmen.

In the operation of auxiliary machinery while the yacht is under way, Diesel electric drive has a real advantage over the direct Diesel type in that power for the auxiliaries can be taken directly from the main generating units, while with direct Diesel driven vessels auxiliary power sets are necessary.

Notable Installations

As stated at the beginning of this article, the first Diesel electric installation was completed by the Westinghouse Company in 1920 in the schooner yacht *Elfay,* a vessel of 313 gross tons, which was owned by Russell A. Alger, Jr., of Detroit. This installation consisted of one 115 brake horsepower Winton engine driving a 75-kilowatt, 125-volt generator and a 9-kilowatt exciter at 425 revolutions per minute. The propulsion motor developed 90 horsepower at 360 revolutions per minute and gave the yacht under power alone a speed of 8½ knots.

In 1921 the auxiliary schooner yacht *Guinevere* was converted to Diesel electric drive. The *Guinevere* is a three-masted schooner-rigged vessel of 508 gross tons and is owned by Edgar Palmer of New York. The equipment consists of two Diesel engines of 350 brake horsepower each, which drive two 225-kilowatt generators and two 15-kilowatt exciters at 225 revolutions per minute. The yacht has a speed of 11.35 knots and is driven by a 550 horsepower motor at 220 revolutions per minute.

The yacht *Alcyone,* of 455 gross tons, which is owned by Henry W. Putnam, of New York, was converted to Diesel electric drive in 1922. This installation consists of two Diesel engines of 210 horsepower each, driving two 140-kilowatt generators and two 15-kilowatt exciters and one double armature motor developing 350 horsepower at 175 revolutions per minute. Under power alone the yacht has a speed of 11 knots.

During the same year, 1922, Diesel electric propulsion was installed in the yacht *Valero II.* This vessel is of 220 gross tons and is owned by Captain G. Allen Hancock of Los Angeles. There are two main generating units, each consisting of a 135 brake horsepower Diesel engine, a 90-kilowatt generator and a 9-kilowatt exciter. The propulsion motor is of the double armature type and develops 215 horsepower at 275 revolutions per minute, giving the yacht a speed of 10½ knots.

Another yacht conversion to Diesel electric drive was the *Cutty Sark* in 1923. The *Cutty Sark* is schooner rigged, with a gross tonnage of 246, and is owned by Alexander Smith, of New York. Her propulsion equipment comprises two Diesel engines of 100 brake horsepower, two 65-kilowatt generators, two 7-kilowatt exciters and one 150 horsepower propulsion motor which drives the yacht at a speed under power alone of 9 knots.

The Highest Powered Diesel Electric Yacht

Last year the auxiliary bark *Aloha,* which is owned by Arthur Curtis James, of New York, was converted to Diesel electric drive. This well known craft has a gross tonnage of 659 and is the highest powered Diesel electric yacht in the world. The electrical equipment comprises three 175-kilowatt generators and three 30-kilowatt exciters directly connected to three Diesel engines of 250 brake horsepower and a double armature propulsion motor of 640 horsepower at 180 revolutions per minute. The *Aloha's* speed under power alone is 13 knots.

On the foregoing yachts all the motors, generators and control of the propulsion and auxiliary machinery, such as the steering gear, anchor windlass, winches, capstans and engine room pumps, which are also electrically driven, were supplied by Westinghouse.

Other inherent advantages of Diesel electric drive which apply to all classes of vessels are economy of fuel, reliability and lower cost of repairs.

CONSTRUCTION LOAN.—A loan not to exceed $3,500,000 for the construction of the S. S. *Virginia* by the Newport News Shipbuilding and Dry Dock Company was approved by the Shipping Board on April 17. The loan will be made from the construction loan fund and will bear interest at 5¼ per cent. The *Virginia* will be a sister ship of the *California,* recently built at Newport News for the International Mercantile Marine Company and now in service in the New York and San Francisco run. The loan authorized is to be for one-half the cost of the vessel but in no case will it exceed $3,500,000.

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Diesel Electric Drive for Freighters*

Multiplicity of power units, permitting quantity production, makes this type of drive particularly applicable in the United States

By W. F. Gibbs†

THE characteristic manufacturing development in the United States is on the basis of quantity production of any unit as against the limited building of single units, or smaller groups of units, in Europe. With Diesel electric drive, there is presented the possibility of the development of quantity production. Direct drive means few large units; electric drive means many small units. The United States cannot compete with any foreign shipyard in building ships with single unit, direct drive Diesel engines because Europe has the genius for economical production of large but single machinery units, or units of limited production, while the efficiency of this country begins with quantity. In order that the United States shall be able to compete, or produce the motive power of a vessel as cheaply, it must find some way to allow quantity production to be developed. And this element, the Diesel engine does permit when coupled with the electric drive.

A Concrete Example

Let me illustrate a little more concretely. The United States Shipping Board has recently commissioned me to recondition and convert the vessels *Courageous, Triumph* and *Defiance*. Those vessels are alike as they are 11,773 tons deadweight capacity; 440 feet in length with 56 feet beam and with steam turbines developing 2,645 shaft horsepower attained a speed of only 10 knots. They were built in 1919. Obviously these vessels are uneconomical in the present day development of the long haul freight trade, for the general type of high class cargo vessel calls for approximately 14 knots. Could, however, these vessels be converted and reconditioned in the United States at a figure that would justify the expense? That was the problem. Following a most careful investigation, it was decided to install in each four Diesel units of 1,200 shaft horsepower each coupled with electric drive. Of course certain changes were made in addition. Eleven feet were added to the bow and the stern frame was changed in order to accommodate a large, slow-revolution propeller, although no other hull changes were made. The result is a 14-knot cargo boat of an entirely modern and competitive character in both speed and capacity.

Of course I do not mean to suggest that the equipping of three vessels with multiple unit Diesel electric drive is a complete establishment of the quantity production system in distinction to the large single unit Diesel principle; I do believe, however, that the advantages of either system, in a great measure, depend upon the characteristic aptitude in production for the country developing it. Please bear in mind that I am speaking of the development of the Diesel electric drive as applied to shipbuilding in the United States—where it unquestionably has distinct advantages in its economic aspects. It might not involve the same factors elsewhere.

The line of development for the United States seems to me to be clearly indicated. The Diesel electric drive, on a multiple basis of a group of low-power-per-unit Diesels, might mean little to an industry where the pressure for quantity production was not invariably the constant goal of its organization and technical engineers. It seems to me inevitable that the Diesel electric drive, with its quantity production—each vessel multiplies by approximately four times the single element of fabrication for its power plant—will be the natural lines along which the United States will develop (at least within the field I am discussing) its shipbuilding industry. This trend will be but following the natural law of economics and human nature, i.e., that everywhere man seeks to follow or develop along the lines of least resistance.

All this may not seem to have a very direct bearing on the Diesel electric drive, and its development. Yet, I think it has. The United States is a tremendous quantity producer of electrical machinery; let it but see a market for quantity production in large electric units and it is obvious the amount of energy that will be brought to bear in reducing costs. In order to market this electrical machinery there will be the natural factor of cooperation with the Diesel manufacturer that will mean still further saving in the economic costs of quantity production and so on all down the line.

Of course, there are, here and there, those that think the United States has no future upon the seas, that she is not a maritime nation. This view is entirely superficial. I believe that the United States is facing a great sea development provided it can only find a means of adopting its flair for quantity production to the large-unit needs of the sea. A nation with over 5000 miles of coast and equipped with its own coastwise shipping has not far to go to enter upon the field of international transportation.

Technical Advantages

As to the technical features of the Diesel electric drive, I believe that they offer very substantial advantages. In the first place there is perfect control of the propeller speed. The multiple unit allows—at these times that a vessel is not so heavily freighted as to require all of its power simultaneously, and this is a not infrequent happening—an opportunity to cut out one unit of its Diesel group and make the necessary overhauling at sea instead of in port with the accompanying loss of sea earning power. This is one advantage. Then there is the direct power control from the bridge by the navigating watch. Units may break down and be useless, it is true, but it is extremely unlikely that all will break down together so that there is a greater element of power continuance and control than in other types. A single Diesel drive, when it goes out of commission, means that it is 100 percent crippled. The multiple unit Diesel electric drive is fairly comparable to a quadruple screw vessel in maintaining propulsion efficiency—at a fraction of the construction cost.

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* This discussion of Diesel electric drive applies only to long haul cargo vessels.

† Naval architect, 1 Broadway, New York.

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Also by the use of two motors giving power to the shaft, the efficiency of cruising operation is still further safeguarded since both of these would have to go out of commission simultaneously in order to cripple the vessel.

Of course, it is sometimes argued that there is a loss of efficiency in transforming the direct Diesel drive into the intermediate phase of generating electric current. That is true. But this difference we have proven to be equally, or more than, compensated for by the adoption of a large propeller with a lower speed of revolution. In other words what is lost at the Diesel engine in electric generation is amply made up in the superior control of speed and in propeller design and revolution. A big, slow-turning propeller holds a vessel up to her speed in bad weather when a faster turning propeller will let the speed drop as each oncoming wave adds its resistance to propulsion.

Then, in addition, with the main power plant electric, there is not needed various separate auxiliary engines; motors are all that are necessary and with a marked saving in space and efficiency. The whole ship is an electric powered ship and with the general efficiency that that means.

Finally, as has been proven to our practical satisfaction, the Diesel electric drive on the multiple unit basis will cost no more in the United States than a direct oil engine drive.

In conclusion let me again state briefly that consideration of the Diesel electric drive involves two important factors aside from the strictly engineering advantages, (a) the natural economic environment of the country adopting it, i.e., as to its adaptability to a quantity production basis in manufacture or its natural superiority in the field of single large unit manufacture, and (b) the engineering and naval advantages of this type of multiple unit Diesel electric drive. As for the United States, I believe that the Diesel electric drive on the multiple unit basis is the natural answer to the problem.

Automobile Ferry Service to Key West

TO fill in a 40-mile water gap in the overseas highway which connects with the Atlantic Coastal Highway at Homestead, Fla., and ends at Key West, 3 wooden automobile and passenger ferry boats have recently been placed in service by the county of Monroe, Fla. These ferry boats which were built by

Diesel ferryboat Florida Keys

the Gibbs Gas Engine Company of Jacksonville, Fla., have a length of 110 feet, a beam of 24 feet, a depth molded of 7 feet and have a capacity of 21 automobiles and 125 foot passengers.

The propelling machinery of each boat consists of two Fairbanks-Morse Diesel engines, with a total of 200 horsepower giving a speed of 11½ miles per hour. A small Delco generating unit supplies the necessary current for the lighting system.

The main deck, which is open, is arranged in 3 gangways to accommodate automobile traffic while the upper deck is fitted with a galley, restaurant, crew quarters and ample saloon accommodations for passengers.

The 3 ferry boats, the *Monroe County*, the *Florida Keys* and the *Key West*, were completed in 90 days after the signing of the contract and cost about $40,000 each.

Progress Made in Marine Standards

CONTINUED growth of interest in the simplifications of ship construction, ship operation, and port facilities, is evidenced in the report of A. V. Bouillon, secretary of the American Marine Standards Committee, for the first quarter of 1928, which has just been made public.

The report shows that four meetings of subject committees and conferences were held during the quarter, exclusive of the annual executive board meeting and the general meeting of the membership of the organization. Ten projects were submitted to subject and technical committees for consideration and two groups of proposed standards were submitted to the membership for approval. There are now numerous proposed standards in progress.

The proposed standards that have been submitted to the membership for consideration are: (a) Deck Scuppers and Drains; (b) End-fittings for Tubular Steel Cargo Booms.

Proposals submitted to subject and technical committees are: (1) Hubs for Built-up Propellers of the Flush-face Type, and Fairwater Caps for same; (2) Revised Scupper Valves, Scuppers and Deck Drains; (3) Medicine Chests and Lists of Medical Supplies; (4) Specifications for Rim Locks for Shipdoors; (5) Specification for Metallic Packing for Condenser Tubes; (6) Proposal to standardize Certain Construction Details; (7) Specifications for Built-up Propellers, Templates for Propeller Blade Flanges and Bolt Holes, and Propellers Cast in One-piece; (8) Specifications for Mortise Locks for Shipdoors; (9) Revised Design of Heel Fittings for Tubular Steel Cargo Booms; (10) Revised Standards for Rigging Screws.

The meetings held during the quarter included the subject committee on Metallic Packing for Condenser Tubes, which reviewed the comments and suggestions received from the membership regarding the proposed standard specifications developed by the committee and the subject committee on Safety Equipment, which considered proposed standards for medicine chests and lists of medical supplies to be carried on ships in various services. These were tentatively approved for submittal to the technical committees on Hull Details and on Ship Operation Details and Supplies. This committee also discussed lifeboat disengaging apparatus, the installation of which is required by law. The meeting tentatively agreed that the service requirements for such apparatus should be defined by standard specifications.

Conferences were held during the quarter with representatives of the Public Health Service regarding proposed standard specification on rat-proofing of ships. Arrangements were entered into whereby the work is to

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be divided between the Public Health Service and the office of the secretary of the American Marine Standards Committee. The subject committee on Rules for Boilers and Pressure Tanks tentatively approved a draft of proposed standard rules for design and construction and a proposed standard specification for boiler steel plates.

As of January 1, 1928, the membership of the American Marine Standards Committee was 330. Since then six applications for membership have been received and will be voted upon at the next meeting of the executive board, which has been tentatively set for some time during May.

Treatment of Feed Water for Evaporators

By T. A. Solberg

THE treatment of boiler feed water has engrossed the attention of chemists and operating engineers for a great many years. The advent of higher pressures, temperatures, and rates of evaporation has served to put additional emphasis on boiler water conditioning. It has been recognized that by supplying pure feed water, which has been obtained by evaporating raw water, further water treatment resolves itself practically to the single matter of maintaining the water in the boiler slightly alkaline.

It is surprising that, with the great amount of effort placed on boiler water treatment, so little has been done towards the treatment of the feed water for evaporators. For the evaporator operates under the most severe conditions as regards its feed water, inasmuch as the necessity of evaporating and distilling the raw water is in itself an admission that the raw water has scale forming or corrosive matter which makes its use direct in the boiler undesirable. Perhaps the worst conditions exist in the plants distilling sea water which has about 1/32 of its weight made up of solid matter held in suspension in the solution.

In ordinary evaporator units the scale is formed on the heating coils or units until the capacity is lowered to such an extent as to necessitate cleaning the coils. Some units are so designed that the scale either cracks off of its own accord or can be made to crack off by producing rapid temperature changes within the shell. Even in these types, however, trouble is experienced from the collection of scale in the bottom of the shell and clogging of the brining lines or blowdown lines. In low pressure plants using a pump for brining purposes, trouble may also be experienced with the pump because of the collection of scale in the pump body and beneath the valves.

Use of Sodium Silicate

The use of a small amount of sodium silicate solution in the evaporator feed water has been found to give very good results when evaporating sea water. The sodium silicate changes the scale forming calcium and magnesium sulphates into the corresponding silicates, which gradually settle out as a soft gelatinous sludge. As this sludge slowly settles to the bottom of the shell it will be removed by whatever method of brining is in use, constant or intermittent. For sea water the best results are obtained by using a 20 percent (by volume) solution of silicate made up from sodium silicate having a gravity of 40 degrees Baume; i.e., 1 gallon of silicate and 4 gallons of fresh water to make 5 gallons of solution. This solution is then fed into the feed water at the rate of about 1 gallon for every thousand gallons of water evaporated. (This rule is only approximate and should be worked out for each individual case). This can be accomplished by connecting the sodium silicate tank to the suction side of the evaporator feed pump or, in the case of low pressure plants, the connection can be made direct to the shell. The amount of solution fed can be regulated by a valve, which can be set for any condition of operation. A small calibrated tank for holding the solution also assists in regulating the amount of silicate being fed.

The best method of feeding the solution is one in which it is being fed constantly at a uniform rate. It may, however, be fed at regular intervals not greater than 2 hours, in the necessary quantity. Another method is to feed constantly for a certain period of time once in each 24 or 48 hours. The interval between periods may be even greater, depending on the plant. Good results can also be obtained by feeding the solution whenever the drop in output indicates the presence of scale and continuing to feed until the normal capacity has been practically regained. As a rule it will be found preferable to use the constant uniform feed method, inasmuch as the sodium silicate is more efficacious in preventing scale formation than in removing scale after it has formed.

Benefits Derived

The benefits to be derived from the use of sodium silicate may be summed up as follows:

(a) Operation of the evaporating plant for longer periods of time with no decrease in output caused by scale. It should also be unnecessary to resort to scale cracking or frequent reversal of effects in multiple effect plants in order to remove scale and maintain normal capacity.

(b) Less wear and tear on material, especially heating elements, because of longer scaling intervals.

(c) Brining or blowdown lines and valves, and valves of brining pumps, do not become clogged with scale.

(d) Actual scaling operations are facilitated and the wear on heating elements considerably lessened because any scale formation is more easily removed.

In conclusion, sodium silicate has no action on the various metals used in any distilling plant and can therefore be used with safety. If the concentration of sodium silicate is allowed to become too high, some trouble may be experienced with priming, especially in low pressure plants; and hence it is important to determine the quantity required for the given conditions and feed it uniformly.

Sodium silicate is relatively inexpensive and can be obtained commercially almost anywhere; and hence does not suffer from the handicap of being a patented expensive compound.

EFFICIENT PROPELLERS.—Savings of about $200,000 a year on fuel have been effected on the United States liner *Leviathan* since the installation of the new three-bladed propellers designed by Admiral Dyson, which were built at the League Island Navy Yard, Philadelphia, and installed during the overhauling of the vessel at the Commonwealth Dry Dock, Boston, in July, 1927. This saving has been effected without any sacrifice in speed as her average speed is about 23½ knots. The average saving per voyage has been about $15,000.

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Questions and Answers for Engineers

Practical information on the operation and maintenance of boilers, engines and auxiliaries

This department is maintained to help those who desire practical information regarding engine room problems or who are preparing to take examinations for a marine engineer's license. Readers are urged to send in questions. Inquiries bearing the name and address of the writer will be answered promptly by mail. If the question is of general interest the answer will also be published in an early issue of the magazine, although the identity of the writer will not be disclosed in doing so. Anonymous communications will not be considered.

Design of the Slide Valve

Q.—How must a slide valve be constructed in order that it will properly perform the four important functions of admission, cut-off, release and exhaust closure?

A.—It must have the proper amount of lap and lead.

Regulating Condenser Temperatures

Q.—How are the temperatures in a surface condenser regulated?

A.—The temperature is regulated by passing more or less circulating water as the case may be through the condenser tubes by means of the injection valve, or by changing the speed of the circulating pump.

Engine Piston Speed

Q.—How would you figure the piston speed of an engine?

A.—I would double the stroke in inches, multiply this by the number of revolutions and divide this product by 12. Thus, with 54 inches stroke and 90 revolutions a minute we would have 54 inches + 54 inches = 108 × 90 revolutions per minute = 9,720 ÷ 12 = 810 feet, which is the total distance traveled by the piston in one minute.

Function of Engine Compression

Q.—What advantage is gained by compression and how can it be increased or decreased?

A.—Part of the steam is confined ahead of the piston, forming an elastic cushion to absorb the momentum of the piston and other moving parts connected with it and bring all to rest quietly at the end of stroke. By adding to or taking away from the inside lap of the valve the compression will be altered.

Definition of Steam and Exhaust Lap

Q.—What is meant by the term lap, steam or outside lap and inside or exhaust lap?

A.—Lap is the amount that the ends of the valve project over the edges of the ports when the valve is at mid-travel. Steam or outside lap is the amount that the end of the valve projects over the outside edge of the steam port; while inside or exhaust lap is the lap of the inside or exhaust edge of the valve over the inside edge of the port.

Use of the Vacuum Gage

Q.—What is the object of the vacuum gage?

A.—The vacuum gage is used to indicate all pressures below that of atmospheric in the condenser. It should always be located where the engineer can see it conveniently at any time.

Purpose of Valve Lead

Q.—What is the reason of giving a valve lead?

A.—The object of lead is to cause the engine to be quick and not to lag at the beginning of each stroke. The live steam admitted through the lead opening also helps and assists in forming a cushion for the piston at the end of the stroke.

Things for Which the Engineer Is Responsible

Q.—What things on a ship is an engineer most responsible for?

A.—That the safety valves are in good order, that there is enough water in the boilers, that steam is kept as uniform as possible, that the machinery is in good order and that strict discipline is maintained in his department.

Area of Pump Pistons

Q.—Why is the area of the steam piston greater than that of the water plunger?

A.—This is done to give the pressure on the steam side a pronounced excess over the resistance on the water side. This makes possible the overcoming of the resistance in the valves and piping and the forcing of water into the same boiler from which the steam for the operation of the pump originally came.

Duties of Engineer When Accident Occurs

Q.—What are the duties of an engineer in regard to accidents, etc.?

A.—He must report to the local inspector the nature of the accident as soon as possible. If temporary repairs are made to the boilers or engines, he should have permanent repairs made at the nearest port and have same surveyed by local inspectors of the Steamboat Inspection Service and of the American Bureau of Shipping or Lloyds.

Fittings Attached to Surface Condenser

Q.—Name the most important fittings that should be attached to a surface condenser to make it complete?

A.—The following fittings should be attached to a surface condenser: a vacuum gage, thermometers for the injection water, feed water and outlet circulating water; a reverse air valve for the circulating pump; a by-pass pipe, drain cocks, vacuum breaker, manholes and hand holes and necessary valves for auxiliary exhaust and extra feed valves.

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Advantages of the Triple Expansion Engine

Q.—What are the mechanical advantages of triple expansion engines for heavy duty?

A.—The facility with which high rates of expansion may be carried out without bringing excessive strains, stresses, etc., on the framing of the engine and a greater uniformity of twisting moment on the shaft.

Vertical vs. Horizontal Feed Pumps

Q.—What are the principal advantages of a vertical over a horizontal feed pump?

A.—The ease with which it may be attached to a bulkhead and the small floor space occupied, also the facility afforded for the overhauling and examination of the valves, packing and piston rings in both ends of the pumps.

Starting a Direct Current Generator

Q.—What care should be taken in starting a direct current generator?

A.—See that the bearings are well oiled and that the oil rings are free to turn. Inspect all connections for loose screws or wires. Start slowly and see that the oil rings are revolving properly. Turn in all resistance in the field rheostat, then bring the machine up to speed, adjust the rheostat for the normal voltage of the generator and then throw in the load.

End Play for Condenser Tubes

Q.—Why do you consider it necessary to give condenser tubes end play?

A.—Because condenser tubes are subjected to extremes of expansion and contraction due to the great and various changes in temperature which take place. If rigidly fixed in both tube sheets, they would become warped, bent and distorted, and would soon be destroyed and cause serious trouble. There is a space provided between the end of the tube and the shoulder of the screw gland to give the tube the necessary end play.

Fusible Plugs

Q.—Where is a fusible plug placed on a boiler, how is it made and what is the reason of it being used?

A.—The fusible plug is screwed into the top of the combustion chamber and in the event of water not covering it the metal will melt and be blown out, thereby warning the engineer. The fusible plug is generally made of brass with a conical hole in the center which is filled with Banca tin which melts at a temperature of about 447 degrees Fahrenheit. Care should be taken to keep these plugs clean. They should be renewed once a year, generally at the annual inspection.

Cycle of Operations of a Steam Engine

Q.—What is lead; when is the instant of cut-off; the instant of compression and the instant of release in a steam engine?

A.—The amount that the steam port is open when the piston is commencing its stroke is the lead, which is taken at the instant of admission. The instant of cut-off is when the admission of steam to the cylinder is stopped by the steam edge of the valve closing the steam port. The piston is pushed the balance of the stroke by the expansion of the steam admitted before cut-off took place. When the two inside or exhaust edges of the valve coincide with the inner edges of the ports, the piston being near the end of its stroke and the valve at mid-travel is the instant of compression. The instant of release is when the inner edge of the valve commences to open the steam port to the exhaust passage.

Duties of Engineer During Survey

Q.—What are the duties of an engineer under the law when a survey is being held?

A.—At each annual inspection he shall have the boilers and fire room in a clean condition. Boilers filled, safety valves clamped down, furnaces and connection doors opened up to permit a thorough examination of same. To assist the inspector in his duties, to point out to him all defects coming under his observation, to answer all questions truthfully and to the best of his ability, and, if necessary, submit it in writing and swear to it.

Duties of an Engineer in Taking Charge of a Strange Ship

Q.—If an engineer takes charge of a strange ship and has a few days' time before sailing, what should he consider his duty as an engineer?

A.—Give the boilers a thorough inspection; see that the low water gage cocks and water glass cocks are in good working order; note the amount of water over the combustion chamber when the water appears in the bottom of the glass, which should be about 7 inches; note the trim of the ship; see that the fusible plugs are in good shape; note the condition of heating surface and stays; trace up connections from bilge, feed pumps, fire lines, etc.; familiarize himself with engines, auxiliaries, life boat stations and see that all men in his department know their stations at fire drill.

Knock in High Pressure Cylinder

Q.—We have a knock in our high pressure cylinder. When coming on watch the other day I found the piston rod in this cylinder slightly cut in the front, the packing and gland had not been touched and plenty of oil was put on the rod. Would you kindly tell me the cause of this? —H. H. K.

A.—To the best of my knowledge, the cutting of your piston rod can be due only to one of the three following causes:

(a)—The engine may have been recently overhauled, and in so doing the replacement of the rod packing was not properly set up causing a canting of the packing sections with its resulting cutting edges.

(b) During a lay-up period, or while coaling, some foreign substances may have adhered to the rod and been carried up into the stuffing box, gradually worked itself into a position where it would be wedged between the rod and metallic part of the packing, resulting in a cut rod.

(c) Misalinement of piston rod due to adjustments having been made to the crosshead slipper for the purpose of taking up wear caused by play existing in the crosshead path. The piston rod being no longer vertical would be running through the stuffing box on a slant thus causing wear on the rod and at the same time the piston, being thrown out of the true line, might in time work up a ridge at the cylinder ends causing the knock referred to.

Inasmuch as I can see no reason for a knock resulting from the first two solutions the misalinement theory appears the most plausible.

If, however, the knock and wearing of the rod be a coincidence, then the knock may be due to any one of the following causes:

Worn eccentric parts causing excessive lap.
Worn wrist pins, crank pin or main bearing.
Piston rod loose in crosshead or piston.
Loose piston follower, follower nuts or cylinder liner.
Broken piston ring or follower studs.
Piston striking at end of stroke.

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Questions and Answers Relating to Ship Design and Construction

By J. L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Method for Comparing Driving Efficiencies of Different Hull Forms

Q.—Can you give a satisfactory method for comparing the driving efficiencies of different hull forms?

A.—Several methods of greater or less value for this purpose have been proposed and used. The most commonly used method in the past is that referred to as the "Admiralty Coefficient." This coefficient is usually expressed as below:

$$C = \frac{\Delta^{2/3} \times V^3}{\text{I. H. P.}}$$

In which Δ is displacement in tons
and V is speed in knots

Recently Mr. Ayre, in a paper before the Northeast Coast Institution of Engineers and Shipbuilders, suggested a new constant, which he calls "C_2." This constant is equal to—

$$\frac{\Delta^{.64} \times V^3}{\text{E. H. P.}}$$

Mr. A. J. C. Robertson, in his paper before the Society of Naval Architects and Marine Engineers, 1920, entitled "Economical Cargo Ships—Some Model Experiments," used the so-called C method. Mr. Robertson in this paper explained this method in great detail and a careful reading of his discussion will well repay any one interested in the subject.

The vessels investigated by Mr. Robertson were of the slow cargo carrying types, having prismatic coefficients between 0.69 and 0.88 and displacement length coefficients varying from 150 to 190, all relatively large values. This method is believed by the writer to be of particular value for use in comparing ships of this type, because for ships of these speeds, according to Admiral Taylor's investigations, the residuary resistance is not materially affected by large variations in the displacement length coefficient. On this account it is possible to use this method with a great deal of freedom, it being necessary only to restrict the comparison to vessels having the same or closely the same values of the prismatic coefficient.

For ships whose speed length ratios are greater than 0.9, the values of the residuary resistance per ton displacement began to be noticeably affected by variations in the value of the displacement length coefficient, so that in order to compare fairly the qualities of two different underbodies it is essential not only that the prismatic coefficients have closely the same values but that also the values of the displacement length coefficients be approximately the same.

The writer has found it generally satisfactory to plot curves of pounds resistance per ton displacement upon a base of speed length ratio, for ships having closely the same values of the prismatic and displacement length coefficients. Then the effect of differences in such features as shape of waterline, amount of deadwood, character of forebody, flare at the waterline, etc., can be ascertained with some degree of definiteness.

It is believed that the method just described is perhaps the best of those which the writer has used for general purposes. However, he has found that direct comparison with Taylor's standard series, as described in "Shipbuilding Cyclopedia," gives good results for fine lined ships of moderate to high speeds.

Margins in Ship Design

Q.—Can you give me some idea as to reasonable practice in the use of margins in ship design?

A.—This is a somewhat involved subject, because of the many elements requiring consideration in any one ship and of the many types of ships to be covered.

Margins are most essential where safety of life or of the ship or where financial penalties are involved. Stability and strength are characteristics which may be considered as involving primarily the safety of life or that of the ship. Speed and carrying capacity are frequently associated by the terms of the contract with financial penalties.

Stability is generally measured by the value of the metacentric height. In recent years it has been generally conceded that under the most unfavorable condition of loading the metacentric height must have a positive value. Inasmuch as during the construction there is a general tendency for the center of gravity of the ship to rise above the position tentatively calculated at the time of the fixing of the dimensions, it is wise to anticipate this by the provision of excess height of metacenter. In ships of average or large size, the rise of center of gravity has frequently been found to amount to a foot. It is believed to be good practice in fixing the beam to provide a height of metacenter sufficient so that the value of the metacentric height initially accepted will allow for the loss of a foot and yet have a satisfactory value.

In most ships the center of gravity is not far from the load waterline. In ships of certain extreme types, noticeably destroyers and some recently designed passenger vessels with very high superstructures, the center of gravity may be considerably above the load waterline. In cases where its position approaches 50 percent of the draft above the waterline, careful consideration must be given to the range of positive righting arm. It may be necessary to provide an excessive value of the metacentric height in such conditions, in view of the likelihood of a relatively low range of stability.

In considering the strength of a ship as a whole, it

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must be recognized that the accepted methods of investigation have comparative value only. For short, relatively deep vessels the stresses arrived at by the use of the standard method may be from 4 to 6 tons per square inch.

In vessels of greater length, say, 400 to 500 feet, stresses of 6 to 8 tons are considered reasonable. These ships meet waves of their own length a number of times in service and the margin of safety provided, when the calculated stresses are not allowed to exceed these figures, have been found to be sufficient.

Margins for Warships

In destroyers, margins are reduced to the minimum. These vessels are frequently subjected to weather conditions approximating or even exceeding in severity those assumed in the theoretical calculations for bending moment. For this class of vessels, stresses in excess of 7 to 9 tons should not be accepted.

For high speed passenger vessels and large war vessels of the battle cruiser type, 8 to 10 tons or even 10½ tons per square inch may be expected. In this class of ships, as well as in destroyers, it is general practice to use high tensile steels. This provides an additional factor of safety for the tension members. It should be borne in mind, however, that special steels are not more efficient than ordinary steels in withstanding compressive stresses.

Capacity is affected by both the weight and the volume of the ship. It is difficult to secure 3 percent margin either on a volumetric or a weight basis due to business competition, or in war vessels to the demand for superiority in military characteristics. The writer has known many vessels to be designed and successfully built without any weight margins. However, this required the most careful supervision. In many cases these vessels during subsequent service overran their designed displacements due to the gradual accumulation of conveniences and improved appliances, although originally built to designed weight.

Speed is intimately involved with power. Good practice in the design of machinery for cargo vessels provides from 20 to 25 percent power margin over that estimated as necessary to meet service smooth water speed.

One very successful designer and builder of high speed ships regularly designed machinery to give, under extreme driving, power sufficient to develop 1½ to 1¾ knots speed beyond the maximum smooth water trial requirement.

New Books

YACHT RACING—AERODYNAMICS OF SAILS AND RACING TACTICS. By Dr. Manfred Curry. Size, 7 by 9½ inches. Pages, 308. Numerous illustrations. New York, 1927: Henry Holt and Company.

About half of the book deals with the laws governing the construction and proper use of sails, with nature as a guide, as it reveals itself in the wings of birds and utilizing the information gained in the development of the aeroplane as well as in exhaustive experiments with sails themselves in actual service. The latter part of the book is devoted to yacht racing which is treated most thoroughly and scientifically. Not only are the finer points of getting the utmost out of one's yacht discussed, but tactics, both of defense and of offense, against a single opponent and against a fleet, are fully covered. The author has gone further, perhaps, than anyone else in studying the wind and driving force for yachts and although the book is of a highly technical nature, the subject is presented in a practical way and is made of real value to the sailor.

SEAGOING VESSELS OF THE UNITED STATES. Pages 147. Plates 20. Washington, 1927: Superintendent of Documents, Government Printing Office.

This publication contains the name of every merchant vessel and yacht of the United States that has signal letters, the tonnages, dimensions, together with the name and address of the owner. Its special features are distant signals of the international code, storm and hurricane warning signals, and plates in colors of the flags of the leading maritime nations, of the house flags and funnel marks of the principal steamship lines in American trade, and pennants to be used in the international code.

THE TECHNOLOGY REPORTS OF THE TOHOKU IMPERIAL UNIVERSITY, SENDAI, JAPAN. Vol. VII. No. 1. Size, 10¼ by 7½ inches. Pages, 89. Illustrations, 92. Sendai, 1927; Maruzen Company, Ltd., Tokyo and Sendai.

This volume of the technology reports contains five interesting papers of a theoretical nature. The subjects covered are "The Calalytic Oxidation of Cyanogen Gas into Nitric Oxide and the Intermediate Product," "High Angle Radiation of Short Electric Waves," "Study of the Acoustic Transformer by Means of the Motional Impedance," "On the Relation Between the Secondary Electron Emission from Nickel and Tungsten, and Its Temperature," and "On the Time Log of Spark and Surface Creepage."

PROFITABLE APPLIANCE OF ELECTRIC INDUSTRIAL TRUCKS AND TRACTORS IN INDUSTRY. Edited by H. J. Payne. Size 11 by 8½ inches. Pages 96. Illustrations, 136. New York, 1927: The Society for Electrical Development, Inc.

This handbook has been published with the cooperation of 20 manufacturers of electrical industrial trucks and tractors, storage batteries and accessories, who are engaged in a cooperative market development program. It is based on a survey of 200 typical plant operations and describes the operating processes and particular type of truck suited to individual jobs. An outline of operating costs together with a tabulation of direct savings effected by employing this type of equipment is given.

Communication

The Use of Red Lead Paint as a Protective Coating

BROOKLYN, N. Y.

TO THE EDITOR:

Captain H. C. Dinger's article in the April number of *Marine Engineering and Shipping Age* entitled "Corrosion in Machinery and Piping" prompts me to express an opinion. I have read the article from start to finish with considerable interest. It is full of valuable information and instruction relative to the subject, information of real practical use, not only to marine men, but

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as well to those concerned with power plant practice on land.

In the course of the article the author refers to the use of red lead paint as a protective coating for external surfaces against the ravages of corrosion. From my past experience I think there is nothing better for the purpose. Red lead certainly has stood the test of time. Even in cases where red as a color is not desirable for any reason, red lead paint can be and, for best results, should be used as a priming coat.

Not only have I found red lead paint a most suitable covering for external metallic surfaces, but also for internal surfaces of steam boilers and tanks. To those who have never considered it for internal application, it might seem that the conditions of heat and wetness in steam boilers would render such a coating useless and short lived. But such is not the case.

If a properly prepared red lead paint is applied to an internal surface where corrosion or pitting has made a start, it will "stick," and immediately arrest it. In the case of pitting, and roughened surfaces, the paint fills and clings to the plate, and all that the heat seems to do is to bake the red lead into a hard coating that does not easily come off.

Red lead paint for metal surfaces, either for external or internal application, should be mixed with *boiled* linseed oil, stiffer than ordinary paints, and should be well brushed into the pits and on the roughened surfaces. Of course the surfaces should be thoroughly cleaned, and dry, before applying the paint. Red lead paint as described will dry and set firmly within 24 hours after application.

CHARLES J. MASON.

Personal

Captain R. W. McNelley, who for some time has been identified with the firm of **Hibbs & McCauley,** naval architects and marine engineers, San Francisco, has joined the board of **Marine Underwriters** of San Francisco.

William H. Todd, president of the **Todd Shipyards Corporation,** New York, has been elected an honorary member of the **Neptune Association** for his work in connection with the American merchant marine.

J. H. Muller, manager of the canal division of the **Transmarine Lines,** Port Newark, N. J., has been appointed president of the **Canal Carriers Association** which represents the ownership of some 700 boats operated in the State Barge Canal service.

T. E. Thirlaway has been appointed chairman of the board of directors of **Swan, Hunter & Wigham Richardson** in Newcastle, succeeding Sir George B. Hunter, retired. Sir George has been connected with the firm 48 years and will remain a director.

The following officers of the **National Council of American Shipbuilders** were recently re-elected: **Homer L. Ferguson,** president of the **Newport News Shipbuilding & Dry Dock Company,** Newport News, Va., president; **H. G. Smith,** vice president of the **Bethlehem Shipbuilding Corporation, Ltd.,** Bethlehem, Pa., vice president and treasurer; **Henry C. Hunter,** counsel, and **George J. Earl, Jr.,** secretary.

George Watterburry, employed by the **American Shipbuilding Company,** Cleveland, Ohio, for 30 years as superintendent of the marine shops in Cleveland, has retired and will reside in Long Beach, Cal.

Obituary

George F. Lawley, former president of **George Lawley & Son Corporation,** Neponset, Mass., died on March 21 at his home in Boston, Mass. Mr. Lawley was born in 1848. After serving an apprenticeship in the yard and rigging loft of the yacht building concern established by his father in 1874, he became a member of the firm and the original partnership was superseded by **George Lawley & Son.** From a small plant, George F. Lawley enlarged the business from one of small yacht construction to take in large schooners, steam yachts and steel vessels. He was always a sailor himself and his acquaintance was wide among yachtsmen of America. Besides being a member of the Society of Mechanical Engineers, a director of the National Association of Boat and Engine Manufacturers and chairman of its legislative committee, his interests outside the boat building field were legion.

George F. Lawley

E. Platt Stratton, well known naval architect and marine engineer, died recently at the home of his daughter in Garden City, New York. Mr. Stratton was 84 years of age and had been retired since 1918. In his marine career he had been affiliated with the **New York Mail Steamship Company** and was at one time an inspector of steam vessels in the port of New York as well as an engineer of the **Board of Marine Underwriters** of New York. He had been associated as an engineer with the **American Bureau of Shipping** since 1885 and in this service he became chief engineer, chief surveyor and a member of the board of governors. He was a member of the Society of Naval Architects and Marine Engineers, the Institution of Naval Architects and the New York Waterways Association.

E. Platt Stratton

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Ship Construction and Repair News

Proposed work—Bids asked—Bids received—Contracts awarded—Current activities

War Department Approves Hudson River Night Line Plans

INFORMATION has been received that the plan of the Hudson River Night Line, New York, to construct two vessels designed to carry passenger automobiles and motor trucks up and down the river, has been declared acceptable by the War Department, as the vessels would be of value to the government in an emergency for the transportation of military motor vehicles or similar cargo by sea along the coastal shores, or in effecting river transportation.

Officials of the Hudson River Night Line regard the acceptance of the plan as preliminary to approval by the government of the recent application of the line for a loan from the Shipping Board of one-half the total cost of the two vessels, estimated at $1,500,000.

Steel Wharf Barge Contract Awarded

THE St. Louis Structural Steel Company, East St. Louis, Ill., has been awarded a contract for the construction of a steel wharf barge for the Burlington, Iowa, River and Rail Terminals. Plans and specifications for this barge were prepared by the W. F. Schulz Engineering Company, Shrine building, Memphis, Tenn.

The new vessel is to be 214 feet long, 45 feet wide and 6 feet 6 inches deep. She is to be equipped with 20 watertight compartments. The barge house is to be of steel and will be 39 feet wide, 192 feet long and 12 feet clear height inside. Proposals for the construction of this barge were received on January 23, 1928. The price involved was not made public.

Dravo Contracting Co. to Build 3 Atlantic Refining Co. Hulls

THE Dravo Contracting Company, Pittsburgh, Pa., has been awarded a contract for the construction of an oil boat, 90 feet long, 30 feet wide and 8 feet deep, for the Atlantic Gulf and Refining Company, and two derrick boat hulls for the same company, each 60 feet long, 30 feet wide and 6 feet deep. The price involved was not given out.

Fowler Wolfe Co. to Supply Towboat Le Claire Boiler

THE United States Engineer Office, Rock Island, Ill., has awarded a contract to the Fowler Wolfe Boiler Works, Paducah, Ky., for furnishing a boiler for installation on the United States towboat *Le Claire*, at a price of $11,188.

Plans to Be Issued in May for Converting 2 Ships to Burn Pulverized Fuel

PLANS and specifications for the conversion of two ships to burn pulverized coal will be released about the middle of May by Edwin C. Bennet, naval architect and consulting engineer of New York. It is desired to profit by the experience of the steamship *Lingan*, now being converted for the Dominion Coal Co., Montreal, Can., which will have its trial trip as a pulverized coal burner in the latter part of April, before issuing requests for bids on this work.

One vessel engaged in the Atlantic coastwise coal carrying trade is a coal burner at the present time and the other, a general freighter engaged in both overseas and coastwise trades, is burning fuel oil. Both vessels have three 3-furnace Scotch boilers, and a unit pulverizer will be installed for each boiler. In order to meet port conditions and avoid operating the pulverizing machinery at night, the center furnace of the center boiler will not be fitted for pulverized coal, but will be arranged for hand firing with coal.

The names of the vessels to be converted or the owners, have not been disclosed at the present time.

Bids Asked for Two 15-Ton Steel Hull Snag Barges

BIDS were to be received by the United States Engineer office, Memphis, Tenn., until 10:00 A. M., April 30, 1928, and then publicly opened for furnishing all labor and materials and performing all work for two 15-ton steel hull snag barges. The general dimensions of the barges are as follows:

Length, molded, 84 feet; length overall, 84 feet; breadth, molded, 24 feet; depth at side, molded, 3 feet 6 inches; depth at centerline, molded, 3 feet 9 inches; camber (except at bow), straight taper in 11 feet 3 inches; draft when fully loaded, forward, 1 foot 1 inch; draft when fully loaded, aft, 1 foot 1 inch. The transverse system of framing is to be used.

Unless otherwise specified, all work is to be performed in accordance with the current rules of the American Bureau of Shipping.

U. S. Engineers Plan 35 Steel Barges

PLANS and specifications are now being prepared by the United States Engineer Office, Memphis, Tenn., for furnishing and delivering 35 steel barges. Further details will be available at a later date.

Federal Shipbuilding Co. Will Probably Get Contract for Panama S.S. Co. Vessel

IT has been unofficially reported that the Panama Steamship Company, New York, of which T. H. Rosbottom is vice president and general manager, as a result of bids received for the construction of two passenger ships, will probably award a contract for one ship to the Federal Shipbuilding Company, Kearny, New Jersey, low bidder for the work. It is understood that the matter is now being decided in Washington, and as soon as authority has been obtained from the War Department, a formal contract for the vessel will be signed.

The bids received for the ships follow:

Name	Price 1 Vessel	Time (Mo.)	Price (Ea.) 2 Vessels	Time (Mo.)
Federal Shipbuilding Company	$3,495,000	17	$3,370,000	19
Sun Shipbuilding and Drydock Co.	3,580,406	21	3,493,946	24
Newport News Shipbuilding and Drydock Co.	3,610,000	15	3,515,000	17
Bethlehem Shipbuilding Corporation, Ltd. (Eastern Plant)	3,654,000	17	3,589,500	19½
American Brown Boveri Electric Corporation	3,745,000	20	3,580,000	23
Bethlehem Shipbuilding corporation, Ltd. (Union Plant)	3,817,000	18	3,746,000	30

Details of Vessels

The vessels were designed by Cox and Stevens, naval architects, New York. They are each to have a length of 510 feet on the waterline, molded beam 63 feet; molded depth to the main deck 32 feet, and depth to the awning deck 41 feet 6 inches. The machinery for each vessel will consist of geared turbines, developing about 10,000 shaft horsepower. Steam will be supplied by 6 watertube boilers at 300 pounds per square inch pressure and 150 degrees superheat. The ships will have a speed of 16 knots.

Crandall Engineering Co. to Build New Drydock at St. Anthony

THE Crandall Engineering Company, consulting and constructing engineers, East Boston, Mass., has been engaged for the design and construction of a new railway drydock at St. Anthony, near the Northern tip end of Newfoundland, to enable the Mission vessels and others in that vicinity to haul out for repairs. At present the nearest ports where drydocking facilities exist are Harbor Grace and St. Johns, each about 300 miles from St. Anthony and still further from the Labrador coast.

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Proposals Asked for 30-Ton Snag Boat

SEALED proposals were to be received by the United States Engineer office, Memphis, Tenn., until 10:00 A. M., Monday, April 30, 1928, and then publicly opened, for furnishing all labor and materials and performing all work for one 30-ton steel hull, steam-driven, sternwheel snag boat. The general dimensions of the vessel are as follows:

Length, molded	127 feet
Length, overall	146 feet 6-3/16 inches
Breadth, molded	30 feet
Depth at side, molded	4 feet 4 inches
Depth at center line, molded	4 feet 10 inches
Camber, straight taper in 15 feet	0 feet 6 inches
Draft	2 feet 9 inches

The transverse system of framing is to be used.

The boat is to be equipped with two propelling engines of the horizontal high pressure simple type with cranks of the wheel shaft set at 90 degrees. They are to be constructed for a working pressure of 200 pounds per square inch.

Plans for Work on Steamships Eastern Coast and Eastern Guide Under Way

PLANS and specifications for general reconditioning of the steamships *Eastern Coast* and *Eastern Guide* were recently issued and bids were received by Frank S. Martin and Son, naval architects, 25 Broadway, New York. These vessels were purchased from the United States Shipping Board by the Pacific Coast Engineering Company, Seattle, Wash., and are now in Robin's drydock, where bottom examinations were made.

It is believed that after the vessels have been reconditioned, they will proceed to the West Coast where they will be fitted with side ports and other alterations made to fit them as limestone carriers.

15 Lake Freighters to be Converted to Barges

INFORMATION has been received that the United States Shipping Board has given Henry Ford permission to convert into barges, 15 of the 199 lake type freighters which he purchased from the government two years ago. Five will be used to operate on the Great Lakes and 10 will be used in connection with Ford's South American business.

It is understood that the majority of the 199 vessels purchased have been scrapped.

S.S. Ophis Repair Contract Awarded

THE New York Harbor Drydock Company, Inc., New York, has been awarded a contract covering repairs to the Shipping Board steamship *Ophis*, at a price of $12,244, tenders for which were received in New York recently. Other bids received for the work were:

Name	Price
Robins Drydock and Repair Company	$14,562
W. and A. Fletcher Company	14,600
James Shewan and Sons, Inc.	15,644
Morse Drydock and Repair Company	15,920
Staten Island Shipbuilding Company	17,583

Bids for 4 Steel Barges Were Opened on April 16

SEALED proposals were received by the Mississippi River Commission, First and Second Districts, Memphis, Tenn., until 11:00 A. M., April 16, 1928, and then opened, for constructing and delivering f. o. b. bidder's shipyard, four steel sand and gravel barges. The award has not yet been announced.

U. S. Engineer Boiler Awarded

A CONTRACT for the construction of one firebox marine type boiler has been awarded to the Marine Iron and Shipbuilding Company, Duluth, Minn., by the United States Engineer Office, Duluth, at a price of $16,785, bids for which were recently received. One other tender was received from the Goebic Steam Boiler Works, Inc., Duluth, who submitted a price of $17,970.

Southern Shipyard to Build Two Coast Guard Boats

THE United States Coast Guard, Washington, D. C., has awarded a contract to the Southern Shipyard Corporation, Newport News, Va., for the construction of two 34-foot boats, at a price of $3,000 per boat. Tenders for the work were received at Washington a short time ago.

Proposals Asked for Furnishing One Steam Engine

SEALED proposals were recently received by the Missouri River Commission, 1006 McCall building, Memphis, Tenn., and opened, for furnishing and delivering one horizontal, double cylinder, non-reversible steam engine. No further details are as yet available.

Contract for Two Boilers Awarded

A CONTRACT for furnishing two externally fired return tube boilers has been awarded by the Mississippi River Commission, 435 Customhouse, St. Louis, Mo., to the Freeman Manufacturing Company, Racine, Wis., at a price of $2,618. Bids for the work were recently received at St. Louis.

New Corporation Formed

A NEW $2,500,000 company, which will engage in the automobile trade between Cleveland and Detroit to New York, and points along the canal, is in process of incorporation. The new corporation will be called the Lakes and Ocean Transit Corporation and will operate several lake vessels and a fleet of specially designed barges and Diesel tugs. Plans for the construction of 10 barges are now being prepared.

The Company has already purchased two large lake steamers and chartered three Welland Canal vessels for immediate operation to Oswego, New York. Captain M. S. Thompson, Great Lakes representative of the division of operation for the Shipping Board during the World War, will be president of the organization. The main office will be located in New York City.

The new concern has also purchased the holding of the Detroit and Lake Ontario Transportation Company, in which W. T. Riley and Mrs. G. G. Riley were interested. Mr. and Mrs. Riley have both joined the staff of the new company.

Auxiliary Power Units

THE Roumanian Government has recently placed an order for 4-50 kilowatt direct current turbine generator units, with the Westinghouse Electric International Company through the medium of their Italian associate, C. E. M. S. A.

These units will be built at the South Philadelphia Works of the Westinghouse Electric and Manufacturing Company and are to be installed aboard two destroyer leaders which the Roumanian Navy is building at the Pattison Shipyards, Naples, Italy.

The turbines will be of the single impulse wheel type and designed to operate with steam conditions of 298 pounds gage pressure, 108 degrees Fahrenheit superheat and exhaust against 15 pounds back pressure.

Date of Bids for West African Line Postponed to May 29

THE date for the sale of the American West African Line has been postponed from May 15 to May 29 by the United States Shipping Board, which also modified the terms of sale by reducing the required number of North Atlantic voyages from 15 to 12.

This action was taken in the belief that more time was necessary for prospective bidders to prepare their offers and that the original stipulation of 15 sailings was unnecessarily strict.

The line is operated for the board by A. H. Bull and Company, Inc., New York. It operates 12 cargo vessels from Atlantic and Gulf ports to a number of ports on the west coast of Africa.

Shipyard Sale to be Ordered

IT is expected that a formal order for the sale of the Virginia Shipbuilding Corporation, located at Alexandria, Va., will soon be issued by Judge D. Lawrence Groner of the United States District Court for the eastern district of Virginia, and the sale will be conducted by Joseph L. Crupper, the receiver.

The property at Alexandria consists of buildings, machinery, shipways, cranes and other equipment. The site belongs to the government. The corporation was formed by Charles W. Morse during the World War.

Dubuque Boat Works to Build Two Barges

THE Dubuque Boat and Boiler Works, Dubuque, Iowa, has been awarded a contract for the construction of two steel hull mooring barges for the Third Mississippi River District, Box 404, Vicksburg, Miss., at a price of $51,000 for the two barges. Bids for the work were received at Vicksburg a short time ago.

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Construction and Repair Bids

Bids Opened Recently for New York Central Floating Equipment

TWELVE bids for the construction of 5 scows and 10 gasoline hoist barges for the New York Central Railroad were opened a short time ago in the office of the purchasing agent, 466 Lexington avenue, New York city. In addition to the main bid, alternative bids were submitted in each case.

The scows are to have a length of 100 feet and a beam of 33 feet. The gasoline hoist barges will also have a length of 100 feet and a beam of 33 feet. Both the gasoline hoist barges and the scows may be built on the Ellis channel system of construction, although alternative proposals were included, covering the plate method of construction.

Contracts have not as yet been awarded.

Name	Ellis Channel Scows Price Each	C.R.D.	Steel Plate Scows Price Each	Ellis Channel Hoisting Barges Price Each	C.R.D.	Steel Plate Hoisting Barges Price Each	Diesel Drive—Ellis Channel Price Each	Diesel Drive—Steel Plate Price Each
Sun Shipbuilding and Drydock Co.	$37,100	185	$38,490	$48,100	260	$49,280	$50,090	$53,090
Brewer Dry Dock Co.	27,536	450	.....	34,136	450	.....	.....	.....
Charleston Dry Dock and Machine Co.	.....	240	34,731	.....	385	41,200	.....	.....
Staten Island Shipbuilding Co.	27,880	1-140 D + 15 D	28,400	35,280	...	35,190	.....	.....
Dravo Contracting Co.	26,500	150	26,500	33,000	225	33,000	33,850	33,850
Atlantic Coast Channel System Co.	26,174	3-5 M + 20 D	.....	33,174	...	.....	.....	.....
Federal Shipbuilding Co.	31,000	200	34,000	40,000	300	44,000	41,800	45,800
Newport News Shipbuilding and Dry Dock Co.	37,200	210	34,200	44,900	300	41,900	49,760	46,760
American Brown-Boveri Electric Corp.	34,000	180	34,680	39,840	210	41,420	41,160	42,740
Todd Shipyards Corp.	42,223	240	35,953	51,165	448	47,047	52,671	48,553
Midland Barge Co.	29,267	1-4 M + 10 D	28,000	34,900	...	34,300	35,550	34,950
New York Engineering Co.	29,450	220	.....	.....	...	.....	.....	.....

New Bids Received on Pennsylvania Railroad Floating Equipment

IT has been learned that new tenders were received recently for the construction of floating equipment for the Pennsylvania Railroad Company, Philadelphia, Pa. Bids were originally received on January 14, 1928, by the purchasing department of the Pennsylvania Railroad, but these were rejected.

The equipment for which bids were received is the same as formerly which included: Six carfloats, each 250 feet in length and of 10-car capacity; 6 carfloats, each 330 feet in length and of 20-car capacity; two tugboat hulls, each 105 feet long, and one steam lighter, 110 feet long. At the time of going to press, the prices submitted were not available for publication.

Staten Island Shipbuilding Company Bids Low on Ferryboat

WITH a price of $874,000, the Staten Island Shipbuilding Company, Staten Island, New York, submitted the lowest proposal for the construction of one ferryboat, for the city of New York, similar to the *American Legion*. One other bid of $912,000 was received from the Todd Shipyards Corporation of New York. Bids were received by Albert Goldman, commissioner of the Department of Plant and Structures, New York, on Tuesday, March 27.

The new ferryboat is to have a length of 267 feet; breadth over guards 66 feet; molded breadth 46 feet; molded depth about 19 feet 9 inches, and a draft in operating condition 12 feet 6 inches. Her arrangement will be similar to the *American Legion*, having two driveways, steel hull, two decks and the lower cabins will be built and sheathed with steel.

Just before going to press, it was learned that the Department of Plant and Structures had placed a contract for the new ferryboat with the Staten Island Shipbuilding Company at the price above indicated.

The design was prepared by R. W. Morrell, naval architect for New York.

Bids for Wood Material Barges Rejected

TENDERS received at the War Department, Mississippi River Commission, Third District, Vicksburg, Miss., recently, for the construction and delivery of 10 or more steel creosoted wood material barges, were rejected. It is expected that new bids will be called shortly.

The tenders submitted were as follows:

Name	Prices (10) Barges	(11) Barges	(12) Barges	(13) Barges	(14) Barges
Ayer and Lord Tie Company, Chicago, Ill.	$ 93,080	$102,300	$111,300	$120,250	$129,150
West Kentucky Coal Company, Paducah, Ky.	109,430	120,373	131,326	142,259	153,222
Higgins Lumber and Export Company, Inc., New Orleans, La.	143,820	157,407	170,644	183,544	195,819

Bids for 3 Steel Barges Opened

THE United States Engineer Office, Coal Exchange building, Huntington, West Va., received tenders a short time ago, for furnishing and delivering three steel barges, two for Ohio river and one for Kanawha river service. One barge is to be 80 feet long, 18 feet wide, 4½ feet molded depth at gunwale, decked with 2½-inch camber and 4 feet transverse trussed frames.

Two barges are to be 80 feet long, 26 feet wide and 5 feet molded depth at gunwale. Delivery is to be made to the United States Engineers at Marietta, Ohio, all expense and risk of such delivery to be borne by the contractor. The bids received were as follows:

Name	Price 3 Barges
Howard Shipyards and Dock Company	$23,700
Dravo Contracting Company	26,785
Midland Barge Company	27,000
Charles Hegewald Company	28,890
Marietta Manufacturing Company	28,961
Jones and Laughlin Steel Corporation	29,744
R. S. Newbold and Son Company	38,900

The Howard Shipyards and Dock Company, Jeffersonville, Ind., has been recommended for award.

Extensive Repairs to S.S. West Ira

THE Shipping Board received tenders at New Orleans, La., recently, covering repairs to the steamship *West Ira*, which had been damaged by fire. The proposals submitted were as follows:

Name	Price	Days
Alabama Drydock and Shipbuilding Company	$73,929	45
Todd Engineering, Drydock and Repair Company	74,975	45
Galveston Drydock and Construction Company	79,000	45
Jahncke Drydocks, Inc.	87,450	45
Bruce Drydock Company	99,200	45
Johnson Iron Works, Dry Dock and Shipbuilding Co.	128,614	45

Bids Received for S.S. El Coston Repairs

THE W. and A. Fletcher Company, Hoboken, N. J., was low bidder for reconditioning the Southern Pacific Steamship Lines steamer *El Coston* at the opening of tenders in New York recently. Proposals submitted were as follows:

Name	Price
W. and A. Fletcher Company	$20,700
New York Harbor Drydock Company, Inc.	29,795
Todd Shipyards Corporation	29,845
James Shewan and Sons, Inc.	31,976
Tietjen and Lang Drydock Company	32,720
Morse Drydock and Repair Company	34,500

Bids for Six Thrust Blocks Opened

TENDERS were received and opened a short time ago at the office of Captain R. D. Gatewood, manager of the maintenance and repair division of the United States Shipping Board Merchant Fleet Corporation, 45 Broadway, New York City, for furnishing 6 thrust blocks to be used in connection with the conversion of 8 vessels to Diesel drive. The Kingsbury Machine Works, Frankford, Pa., was low bidder with a figure of $3,800 for each set of bearings. The only other bid was that of the S. Morgan Smith Company, York, Pa., which was $4,825 for each set. The award has not as yet been made.

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Newport News Yard Low Bidder for Changes to S.S. Wheaton

WITH a price of $134,300 and a time of 55 continuous running days, the Newport News Shipbuilding and Drydock Company, Newport News, Va., submitted the lowest proposal for converting the steamship *Wheaton* from a refrigerator ship to a straight cargo carrier. Bids for the work were received on Wednesday, April 11, 1928, at the office of Charles E. Ross, naval architect and marine engineer, 16 Exchange place, New York. Other tenders received were:

Name	Main Price	C.R.D.
Sun Shipbuilding and Drydock Company	$138,560	55
Morse Drydock and Repair Company	147,388	60
Maryland Drydock Company	156,953	57
W. and A. Fletcher Company	165,500	75
Bethlehem Shipbuilding Corporation, Ltd.	177,000	55
Robins Drydock and Repair Company	179,500	65
Tietjen and Lang Drydock Company	183,425	69
Staten Island Shipbuilding Company	191,382	60
Kensington Shipyard	196,000	100

The award has not as yet been made.

New York Harbor Drydock Co. to Repair S.S. Western Knight

THE New York Harbor Drydock Company, Inc., New York, was successful bidder with a price of $5,144, for general repairs to the American-South African Line steamship *Western Knight*. Nine other tenders received for the work were:

Name	Price
Morse Drydock and Repair Company	$5,290
James Shewan and Sons, Inc.	5,494
W. and A. Fletcher Company	5,724
Theodore A. Crane's Sons Company	6,100
Tietjen and Lang Drydock Company	6,370
Todd Shipyards Corporation	6 520
Robins Drydock and Repair Company	6,690
Federal Shipbuilding Company	6,700
Staten Island Shipbuilding Company	8,370

S.S. Robert E. Hopkins Repairs

THE Tidewater Oil Company, New York, has awarded a contract to the New York Harbor Drydock Company, Inc., New York, covering general repairs to the steamship *Robert E. Hopkins*, bids for which were received in New York recently. The tenders received were as follows:

Name	Main Price
New York Harbor Drydock Company, Inc.	$6,360
Morse Drydock and Repair Company	6,574
Robins Drydock and Repair Company	6,950
Tietjen and Lang Drydock Company	7,190
Todd Shipyards Corporation	7,210
Staten Island Shipbuilding Company	7,576
Theodore A. Crane's Sons Company	8,986

Extensive Reconditioning Necessary to S.S. Mundelta

TENDERS were recently received in New York covering repairs to the 4,747 gross-ton steamship *Mundelta* of the Munson Steamship Line, 67 Wall street, New York. Plans and specifications for the work were prepared by Frank S. Martin and Son, naval architects, 25 Broadway, New York. The bids submitted were as follows:

Name of Company	Spec. No. 1	Spec. No. 2	Spec. No. 3	Price Per Rivet	Owners Voyage Repairs	Time
Bethlehem Shipbuilding Corporation, Ltd.	$10,500	$5,527	$2,250	$0.80	$1,385	17
Maryland Drydock Company	10,940	6,581	2,658	0.85	1,436	18
Robins Drydock and Repair Company	11,340	5,100	2,470	0.90	1,425	19
Morse Drydock and Repair Company	11,600	5,900	2,500	0.85	1,450	21

The specifications call for the renewal of about 20,000 rivets so that this item, according to the prices submitted per rivet amounted to between $16,000 and $18,000 in addition to the specification items mentioned above. No award has as yet been made.

S.S. Edenton Repair Bids Opened

WITH a price of $12,842, the Morse Drydock and Repair Company, Brooklyn, New York, submitted the lowest tender covering repairs to the Shipping Board steamship *Edenton*, bids for which were received by the Board in New York recently. Other bids were:

Name	Price
New York Harbor Drydock Company, Inc.	$13,382
Robins Drydock and Repair Company	13,610
W. and A. Fletcher Company	14,000
Federal Shipbuilding Company	15,955
James Shewan and Sons, Inc.	16,167
Theodore A. Crane's Sons Company	18,729
Staten Island Shipbuilding Company	20,980

S.S. Olen Repair Proposals

BIDS have been received by the United States Shipping Board, N. Y., covering repairs to the steamship *Olen*. Ten proposals were received as follows:

Name	Price
Moon Engineering Company	$19.122
Warwick Machine Company	19.778
W. and A. Fletcher Company	20.800
Staten Island Shipbuilding Company	22,940
Newport News Shipbuilding and Drydock Company	24.574
Morse Drydock and Repair Company	24,769
Norfolk Steamboat Company	24,978
Tietjen and Lang Drydock Company	26.132
Southern Shipyard Corporation	26.811
Colonial Shipyard	32,892

S.S. Swiftwind to be Repaired At Robins Drydock

A CONTRACT for repairs to the steamship *Swiftwind*, of 8,207 gross tons, has been awarded to the Robins Drydock and Repair Company, Brooklyn, New York, by C. D. Mallory and Company, Inc., New York, bids for which were recently received. The proposals submitted were as follows:

Name	Main Price	Separate Price	Time (CRD)
Robins Drydock and Repair Company	$2,675	$6,091	6
Staten Island Shipbuilding Company	4,296	4.300	6
Theodore A. Crane's Sons Company	4.480	5.123	5
Morse Drydock and Repair Company	4,513	5,103	6

Bids for 4 Water Coolers and 4 Oil Coolers

TENDERS were received at the office of Captain R. D. Gatewood, manager of the maintenance and repair division of the United States Shipping Board, 45 Broadway, New York, on April 24, 1928, and opened, for furnishing and delivering 4 water coolers and 4 oil coolers, for use in the Shipping Board Diesel conversion program.

Bids Opened for Alterations to the Steamer Chelsea

INFORMATION has been received that bids were privately opened at the office of George G. Sharp, naval architect, New York city, recently, covering alterations to the steamer *Chelsea*. It is understood that the *Chelsea* may be used by Frederick E. Lewis, of New York city, for special submarine studies in various parts of the world.

The work on the vessel will include the installation of new engines, the change from a single to twin screw vessel and complete alteration of the bow. Other special work in the hull to fit her for her new duties will be carried out.

No decision has as yet been made on awarding a contract, but it is expected that further information will be available for publication shortly.

Peterson S. S. Company Retains Engineers

THERE will be no change this year in the chief engineers for the boats operated and managed by the Peterson Steamship Company, Cleveland, O., according to a recent announcement by Frank J. Peterson, president.

Vessels and chief engineers assigned to them are as follows:

Peterson Steamship Lines

Vessel	Chief Engineer
John Ericsson	George Winter
Alexander Holley	W. S. Payne
Frank J. Peterson	John L. Scott

Midwest Transportation Company

Vessel	Chief Engineer
E. M. Bunce	George R. Vosburgh
Oscar J. Lingeman	Andrew Olmstead
Aetna	George Larabie

Engineers for Columbia Steamship Company

THERE is no change in the personnel of the chief engineers who will sail in the fleet operated by the Columbia Steamship Company, Cleveland, Ohio, this year, according to announcement of John T. Kelly, manager. Vessels and the engineers assigned to them follow:

Vessel	Chief Engineer
J. A. Topping	Chris Johnson
Joseph H. Frantz	Harry Roberts
William Livingstone	O. Anderson
C. R. Hubbard	C. W. Gustin
H. D. Goulder	Matt Flagsted
L. B. Miller	August Oliva
H. M. Hanna, Jr.	A. E. Bates
D. Z. Norton	J. A. Southgate
W. C. Richardson	James E. Eustice
William F. Stifel	George Marcoux

Engineer Personnel for Cleveland and Buffalo Line

THE engineer personnel appointments for the Cleveland and Buffalo Transit Company steamships *Seeandbee*, *City of Buffalo* and *City of Erie*, which will ply between Cleveland and Buffalo this season, are as follows:

The steamship *Secandbee* appointments are: George Turnbull, chief engineer; W. H. Caine, first assistant; E.

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W. Blanchard, second assistant, and Harry O'Dette, third assistant.

The *City of Buffalo:* D. D. Donaldson, chief engineer; Frank Stockton, first assistant, and Alex Greb, second assistant.

The *City of Erie:* William Robinson, chief engineer; Donald Lewis, first assistant, and A. J. Phillips, second assistant.

French Shipbuilding Outlook Shows Improvement

SEVERAL developments of outstanding importance have recently taken place in shipbuilding circles in France.

The Cie. Gle. Transatlantique (French Line), which had not ordered a ship since the *Ile de France* was completed, has just contracted with the Chantier et Ateliers de St. Nazaire Penhoet for the building of a new motor, cabin class liner for the Havre-New York run, which is to be of similar size to the *De Grasse.* The machinery of this motorship is to consist of 4 M. A. N., two-cycle, double acting engines, each driving directly one propeller shaft.

Next year the French line is planning to order from the same builders a new first class liner of somewhat larger diminsions than the *Ile de France.* This new liner will be ready for service in 1932.

Another important order is that to be placed shortly by the Cie. Sud-Atlantique very likely with the Penhoet Company for the building of a 25,000-ton quadruple screw liner for the Bordeaux-Brazil, River Plate service.

The Messageries Maritimes has placed with the Societe Provencale de Constructions Navales an order for a new motor liner to be named *Jean La Borde,* for operation on the Indian Ocean line. This vessel will be fitted with 2 Burmeister and Wain engines to be supplied by Messrs. Schneider et Cie. The same company is also about to place an order for a bigger motor liner, to be named *Felix Roussel.* When these are completed this firm will own a total of 4 motor liners.

The Compagnie Paquet has ordered from the Forges et Chantiers de la Mediterranee a new passenger steamer for the Morocco line to be named *Nicolas Paquet.* The Cie. de Navigation Mixte has ordered from the same yard a passenger steamer for the Algeria service. Both of these vessels will be steam driven and fitted with Prudhon-Capus boilers (as installed on the *Ile de France*).

Another interesting event is the approval given on March 15 by the Chamber of Deputies to the scheme known as the Credit Maritime which is intended to enable French shipowners to borrow money at low rates of interest for new ship construction. The bill has still to be ratified by the Senate.

Orders have been placed by the French Navy with private yards for five 1,560-ton and four 630-ton submarines, which will greatly stimulate Diesel engine construction in France. The Navy has ordered two 6,000-horsepower Sulzer engines for a new submarine depot ship. The first 1,500-ton French submarine, the *Redoubtable* was launched on February 24.

In the course of her recent trials, the new 10,000-ton cruiser *Duquesne* attained a speed of 35.3 knots, which is a record figure for a ship of this class.

Supply Trade

New Bethlehem Pipe Mills in Full Operation

ACCORDING to a recent announcement, the new pipe mills of the Bethlehem Steel Company, at the Maryland plant, Sparrows Point, Md., are now in full operation. The pipe unit comprises 2 butt mills designed for the manufacture of butt welded pipe, from ⅛ inch to 3 inches in diameter; 2 lap mills equipped to manufacture all sizes of lap welded pipe, from 2 inches to 16 inches in diameter; a galvanizing department and all auxiliary equipment.

Westinghouse Issues Monthly Marine Bulletin

IN ORDER to keep the marine field informed of developments made by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., of equipment for merchant or naval vessels, this company has issued the first of a series of monthly marine bulletins which will continue for the remainder of the year.

The leading article of this first issue entitled "Reducing the Overhead," outlines the present status of the American merchant marine and offers suggestions which would bring about a modernization of our trade fleet.

The remainder of the bulletin is devoted to a discussion of the advantages and economies of Diesel electric propulsion for tug boats. General details of three typical tug boats of this type are given and a comparison of operating statistics for various drives is included.

Marine Diesel Engine Development in the United States

IN THE current issue of *Commerce Monthly,* published by the National Bank of Commerce in New York, a review entitled "Diesel Engine Manufacture in the United States" outlines among other things the present status of the marine Diesel engine in this country. Excerpts from this review are given below:

A rapidly rising trend of sales since 1921 indicates that the Diesel engine in the United States has passed from the experimental to the production stage of manufacture.

According to the Bureau of the Census the output of Diesel engines has increased from a total of 330 engines aggregating 89,039 horsepower in 1921 to 4,101 engines of 409,390 horsepower in 1925.

In 1925 for the first time the census report separated marine Diesels from the stationary or land types. Of the 4,101 motors produced in that year 1,105 or 27 per cent were marine engines and 2,996 stationary. From the standpoint of aggregate power the proportions were roughly the same.

Rapid progress has been made abroad in adapting the Diesel engine to engineering requirements of ocean transportation. In the world at large there are some 4,000,000 gross tons of motorships afloat and of the tonnage under construction more than a half is being equipped with Diesel engines.

Advances abroad, however, have not been reflected by corresponding gains in the United States. Comparatively little interest has been displayed in the construction of ocean going motorships largely because higher capital and operating costs tend to restrict American participation in ocean transportation. Diesel engines have been installed in 12 Shipping Board vessels and a second program has been initiated. Private construction includes the conversion of some 25 steamships to motor drive. Altogether, however, the gross tonnage of all American vessels in foreign trade equipped with Diesel engines is only 192,000 compared with a total tonnage in this class of 7,317,000.

But operations in domestic waters protected from the competition of foreign ships constitute a market for American oil engine manufacturers encouraging as much by reason of its breadth and potentialities as because of the progress that the oil engine has made. Of the 26,000 vessels under American registry enrollment and license some 21,300 aggregating 9,600,000 tons operate in American waters exclusively. In some of the divisions into which this tonnage may be separated, the Diesel is already well established; in others sales pioneering remains to be done.

One of the most promising divisions at present is the tow boat field. There are probably more tugs in operation than any other single type of ship in the world and American harbors in particular are thronged with them. Diesel power is peculiarly well adapted to boats of this class since by fuel economy and the avoidance of standby losses fuel bills are cut to a third those of equivalent steam tugs.

Closely allied is the ferry boat class. With electric drive, the Diesel has come practically to monopolize new construction in this line. Intercoastal freight and passenger vessels afford good opportunities for capitalizing oil engine economy and several Diesel driven vessels are in this service. The western rivers, the Great Lakes, the bays and sounds of the country abound with craft which could profitably utilize the Diesel engine. Custom, however, is a power to be reckoned with and there is a good deal of sales resistance to be overcome before the opportunities of the marine field can be fully exploited.

Business and Personal

John G. Platt has been appointed president of the **Hunt-Spiller Manufacturing Corporation,** Boston, Mass., succeeding **Walter B. Leach,** deceased.

The permanent officers and directors of the new **Tacoma Oriental Steamship Company,** with headquarters in Tacoma, Wash., and also an office in Seattle, are as follows: **John S. Baker,** chairman of the board; **S. M. Jackson,** president; **George P. Wright,** vice president; **J. F. Hickey,** treasurer; **S. J. Maxwell,** secretary; **Ira Bronson,** Seattle, **J. C. Dickson, J. A. Eves, Henry A. Rhodes, Ralph H. Shaffer,** of Tacoma, directors. The company recently purchased 7 freighters from the Shipping Board to operate from Puget Sound to the Far East.

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Justin G. Smeby has been appointed welding engineer at the South Philadelphia Works of the **Westinghouse Electric & Manufacturing Company.** Mr. Smeby is a member of the American Society of Naval Architects and Marine Engineers and an officer in the United States Naval Reserve Force.

The **National Flue Cleaner Company,** Groveville, N. J., manufacturers of soot blowers for firetube boilers, has recently appointed the **Furnace Improvement Company,** Providence, R. I., representative in New England and the **Naylor-Hickey Corporation,** Chicago, Ill., representative in Chicago.

The executive offices of the **Worthington Pump & Machinery Corporation,** also its export sales department and New York district sales department have moved to 2 Park avenue, New York. The head office, sales and advertising departments have been moved to the Harrison plant of the corporation, located at 421 Worthington Avenue, Harrison, N. J.

The **Colgan Manufacturing & Supply Company** will move from its present location at 118-120 Maiden Lane, to new quarters at 8-10 Bridge street, New York. The Colgan Manufacturing & Supply Company is the sole manufacturer of Colganoil, a high grade marine lubricating oil, which has been in use for nearly 50 years.

Joseph S. Jones, vice president of, and for ten years associated with, **Charles Cory & Son, Inc.,** manufacturers of marine equipment, has resigned. He entered the service of this company as engineer and since that time has occupied the position of general commercial manager, assistant to president and general manager and vice president in charge of sales and engineering, which position he held up to April of this year when his resignation took effect. He has been responsible for the creation and development of various types of signal and communicating appliances, both for marine and industrial purposes.

Henry F. Schmidt, consulting engineer of the **Westinghouse Electric & Manufacturing Company,** South Philadelphia Works, has been recently awarded the medal of the **American Society of Naval Engineers** for the best article submitted during the year 1927. Mr. Schmidt, besides being awarded a gold medal, was given an honorary life membership in the society and a cash prize for his paper, entitled "Some Screw Propeller Experiments with Particular Reference to Pumps and Blowers." The presentation of the awards to Mr. Schmidt was made by Secretary of the Navy Wilbur at the annual dinner of the society which was held at the Willard Hotel, Washington, D. C.

Trade Publications

DIESEL YACHT CRESSIDA.—A booklet has been distributed by Cox and Stevens, New York giving a complete description of the seagoing auxiliary Diesel yacht *Cressida* built for Hermann Oelrichs.

GAS RANGES.—The Stamford Foundry Company, of Stamford, Conn., has issued a catalogue describing Shipmate gas ranges. These may be used on yachts and small vessels and are capable of doing all sorts of cooking including baking and broiling. The fuel, a non-poisonous gas, is contained in steel cylinders which are easily stored.

BOILERS.—The Hartford Steam Boiler Inspection and Insurance Company, Hartford, Conn., has issued the second edition of "The Boiler Book." This book contains some of the data most frequently required for the design and installation of boilers and other pressure vessels.

FUEL BURNING SYSTEMS.—A booklet giving a "Description of Peabody Fuel Burning Systems and Operating Instructions," has been published by the Peabody Engineering Corporation of New York. The Peabody-Fisher wide range oil burner, the Peabody gas burner and combined gas and oil burner as well as the pulverized coal burners are described.

AUXILIARY TURBINE GENERATOR UNITS.—The Westinghouse Electric and Manufacturing Company, South Philadelphia, Pa., has recently released a leaflet No. 20-338 describing marine auxiliary turbine generators. The leaflet covers units of 5 to 15 kilowatts capacity for direct current operation, using direct connected turbines. This leaflet also describes geared turbine generator units for alternating current service in ratings from 25 up to and including 500 kilowatts.

NICKEL CAST IRON.—Bulletin No. 205, the fifth of a series on nickel cast iron, has been published by the International Nickel Company of New York. The article entitled "The Practical and Economic Value of Nickel and Chromium in Gray Cast Iron," was written by D. M. Houston. A comparison of costs and savings for various alloys is given.

GAS CUTTING.—A pamphlet issued by the Air Reduction Sales Company of New York, entitled "Factors Involved in Economical Gas Cutting," by J. L. Anderson, has been received. While the author did not undertake to give a complete analysis of all the factors involved in cutting, he has covered those of most importance to the average user of the cutting process.

DIESEL ENGINES.—A bulletin describing the new type Winton Diesel engine has been issued by the Winton Engine Company of Cleveland, Ohio. The installation of two of these engines in the 94-foot cruiser-houseboat *Nicoya* owned by F. B. Lovejoy marks the introduction of this engine in the first known Diesel powered houseboat.

BURNERS.—A pamphlet entitled "What's New" has been distributed by the Peabody Engineering corporation of New York. New equipment manufactured by this concern is described in this booklet. Among the new types of products are the "Toronto" powdered coal burner, the insulated burner front, oil burners, combined gas and oil burners and a new automatic viscosity regulator.

Marine Societies

America

American Marine Association. 30 Church St., New York. President—Col. E. A. Simmons.

American Marine Standards Committee. Chairman, Colonel E. A. Simmons. Secretary, A. V. Bouillon, Division of Simplified Practice, Department of Commerce, Washington, D. C.

American Society of Marine Designers. Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

American Society of Marine Engineers. 605 Market St., San Francisco, Calif. President—Henry F. Gelhaus. Secretary—Wm. H. Thille.

American Society of Naval Engineers. Navy Department, Washington, D. C. Secretary Treasurer—Commander H. B. Hird, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

American Steamship Owners' Association. 11 Broadway, New York. President—H. B. Walker.

Atlantic Coast Shipbuilders' Association. 1600 Walnut Street, Philadelphia, Pa. Secretary—C. S. King.

Council of American Shipbuilders, Inc. 50 Broadway, New York. President—Homer L. Ferguson. Secretary-Treasurer—Henry C. Hunter.

Jersey Marine Club. 4th and River Streets, Hoboken, N. J. Secretary—Fred L. Broad.

Lake Carriers' Association. President—J. S. Ashley. Secretary—George A. Marr, Rockefeller Building, Cleveland, O.

National Association of Engine and Boat Manufacturers. 29 West 39th Street, New York City. Secretary—Ira Hand.

National Association of Masters, Mates and Pilots. National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

National Marine Engineers' Beneficial Association. Headquarters 311-315 Machinists Building, Washington, D. C. President—Wm. F. Yates. Secretary—Albert L. Jones.

Neptune Association. 21 Pearl St., New York City. Secretary-Treasurer—Captain John F. Milliken.

New York and New Jersey Dry Dock Association. 111 Broadway, New York. President—Jonathan Moore.

Ocean Association of Marine Engineers. 15 Whitehall St., New York. Secretary—Bert L. Todd.

Port of New York Authority. 75 West Street, New York. Chairman—George S. Silzer. Secretary—Wilson J. Vance.

Society of Naval Architects and Marine Engineers. 29 West 39th Street, New York. Secretary and Treasurer—Daniel H. Cox.

The Maritime Association of the Port of New York. 78 Broad St., New York City. President—John Dowd. Secretary—John F. Manning.

The New York Tow Boat Exchange. 11 Moore St., New York. Manager—Langdon W. Smith.

The Propeller Club of the Port of New York. President—Harry W. Parsons, 111 Broadway, New York. Secretary—W. Z. Gardner, 136 Liberty Street, New York.

United States Naval Institute. Naval Academy, Annapolis, Md. Secretary and Treasurer—Captain H. A. Baldridge, U. S. N.

United States Ship Operators' Association. 140 Broadway, New York. President—Winchester Noyes.

Canada

Grand Council N. A. of M. E. of Canada. Grand Secretary-Treasurer—W. A. MacDonald, 62 Albert St., Halifax, N. S.

Great Britain

Institute of Marine Engineers, Incorporated. 85/88 The Minories, London, E.1.

Institution of Engineers and Shipbuilders in Scotland. 39 Elmbank Crescent, Glasgow.

Institution of Naval Architects. 5 Adelphi Terrace, London, W. C.

North East Coast Institution of Engineers and Shipbuilders. Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

France

Association Technique Maritime et Aéronautique. Secrétariat Général—7, rue de Madrid, Paris (8e).

Italy

Collegio Degli Ingegneri Naval e Meccanici in Italia.

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